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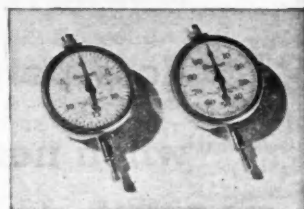
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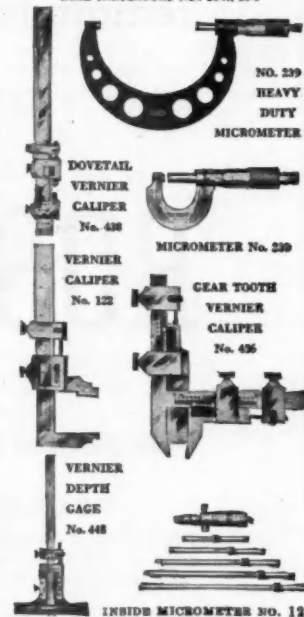
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Firmer Tone in Retail Market

Sales Rise After Early May Slump; Summer Outlook Good

by Harold E. Gronseth
Detroit News Editor, Automotive Industries

A firmer tone to the retail automobile market is revealed by recent sales figures and reports from the field. Apparently the seasonal decline, which had been suggested by the hesitancy in demand appearing earlier in the month, is not yet at hand since successive gains have been shown by weekly reports for the last two weeks and companies reporting by 10-day periods for the most part have a better showing in the second 10 days of May.

Hopes have been strengthened that retail demand will continue strong well into the summer. Although the dealer code was being very generally violated, its elimination is expected to provide some stimulus to the new car sales at the expense of heavier used car stocks and dealer profits unless offset by sufficient gains in new car volume. Higher priced makes which suffered particularly by code restrictions should find a better market as dealers step up allowances on cars taken in trade. The higher priced market already has shown signs of reawakening, as more and more motorists appear to be returning to their normal price classes.

Surveys by sales executives in various sections of the country are highly encouraging. "Business in general and the automobile business in particular appear to be improving steadily throughout the East," says J. C. Chick, Cadillac sales manager. "One favorable indication is the sharp pick-up in retail sales of medium and high-priced cars."

W. M. Purves of Dodge Bros. finds conditions good in the Middle West.

"Fields, moist again, are being worked and there is a general anticipation of good crops," he said. "Cattle money is coming in, and farmers who bought feeders last year are selling at good profits." J. D. Bruek, director of truck sales, said he "had never seen the Mid-West in such good shape so early in the year." Forest Akers, Dodge Sales executive, reporting on the East, says dealers there report their business in

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GM Plans No Change in Wages, Sloan Says

Holds We Need to Stop Obstructing Recovery

"We no longer need to promote recovery—but we do need to stop obstructing it," Alfred P. Sloan, Jr., president of General Motors, said in a statement issued this week in which he announced that the corporation contemplates no material wage adjustments.

His statement follows:

"I am asked for an expression of opinion with respect to the broader aspects of the United States Supreme Court decisions of Monday, on the problem of national recovery.

"First, as to the wage scale, as I have already stated, I am convinced that there will be no material readjustments downward. Certainly General Motors is not contemplating any such thing. The highest wage scale is the best wage scale, providing it is not out of balance with other factors in the national economy.

(Turn to page 745, please)

Miller Type Engines Take First 10 in 500

INDIANAPOLIS, May 30—Miller type racing engines swept the first 10 places in the annual 500-mile race here today which Kelly Petillo won at the new record speed of 106.230 m.p.h., breaking the record of 104.468 m.p.h. set last year by Cummings. Second and third places went to Shaw and Cummings who also broke the previous records with speeds of 105.990 and 104.758 m.p.h. respectively. Roberts took fourth place with Hepburn, Cantlon, Gardner, Litz, Mackenzie and Miller following in order.

Eight of the first 10 cars had four-cylinder engines, the exceptions being Hepburn's Veedol Special and Chet Miller's Milac F. D. Special which were powered with eight-cylinder designs. The semi-stock cars which have given such a good account of themselves in recent races here were not so successful as in the past. This, however, may be attributable to the lack of sufficient time in preparing the cars for the test.

Of the four Ford V-8 specials, entered by Harry Miller and which were successful in qualifying, three went out because of steering gear seizure and the fourth developed bearing trouble on the 144th lap because of insufficient oil. In connection with these revamped Fords, it is generally believed that more would have been successful in passing the qualifying tests, if time had been available, as at least four of these cars were lined up waiting their turn when the time for qualifying trials expired.

An accident early in the race, resulting in the death of Clay Weatherly, marred the event.

White Strike Ends

CLEVELAND, May 29—The strike at the White plant ended today. After examination of company books, union leaders did not insist on a wage increase.

Industry Sees NRA Decision as Having Little Immediate Effect on Operations

No immediate changes in the operating procedure of the motor industry is anticipated as a result of the Supreme Court's decision killing the NRA and wiping out all codes. Executives of the leading companies have officially announced that they contemplate no change in the wage level and while all have not made public announcement, it is understood that motor vehicle manufacturers

generally will adhere to the wage policies which were in effect before the passing of the NRA.

Aside from the traditional policy and the desire of manufacturers to maintain high wage standards, the more or less delicate labor situation which obtains would stand in the way of reductions in workers' pay. As has been recently

(Turn to page 741, please)

April Production Biggest Since 1929; Census Bureau Gives Sales to Dealers

April production of cars and trucks in the United States and Canada soared to the highest levels reached since August, 1929, according to final figures issued this week by the Census Bureau. Total output for the month was 501,837, an increase of 11 per cent over March and of 35 per cent over April, 1934. In the first four months, the industry produced 1,610,883 units, representing a gain of 43 per cent over the same period last year.

The official April total is about 24,000 above the AMA estimate. The difference is understood to be due to the fact that the estimate did not include Ford Canadian production and foreign assemblies.

The Census Bureau release this month contains a modification of outstanding importance since in addition to showing total production in this country and in Canada, it also divides production in two groups—units sold to the domestic dealers and those going into foreign markets. This change in the method of presenting the data permits stacking sales to dealers up against sales to users, so far as the domestic market is concerned, to obtain an indication of the trend of field stocks. While it has been possible to do this in the past in a rough way, the difficulty of getting accurate figures covering foreign assembly of parts made here has complicated calculations.

According to the Bureau's figures, 1,176,326 passenger cars were sold to dealers in the United States in the first four months. In the same period registrations of new cars approximated 889,000. This gives an indicated increase in dealer stocks of 287,000. The actual increase was less than this due to the fact that in the first part of the year registrations lag sales. According to authoritative estimates, actual sales were 980,000, which would reduce the increase in dealer inventories to 196,000 in the first four months.

Sales of trucks to U. S. dealers in the first four months totaled 221,013 as compared with registrations of about 157,000

and estimated actual sales of 180,000. The indicated rise in domestic truck inventories, therefore, was roughly 41,000 in the first four months.

The apparent increase in domestic stocks of new cars and trucks on this basis was 237,000 units in the first third of the year.

Detail figures are given in the accompanying table.

Ford Report Reflects Overseas Conditions

Variance of European Business Situations Emphasized by Perry

The report of the directors of the Ford Motor Co. Ltd., was presented at the corporation's annual meeting, held last month at Dagenham, England, and is a reflection of the widely varying business conditions in Europe.

The most uncertain conditions, according to Sir Percival Perry, K.B.E., chairman of the company, prevail in Germany. The interest of the British company in the German Ford company was sold last year for the sum of £555,729. In 1930 the value of this interest, as indicated by Berlin Bourse quotations, was £986,784, in addition to which a further mks. 2,375,000 was subscribed for additional shares, at par. The German company still owes the parent company £172,736 which it is impossible to transfer out of Germany under present regulations.

Import restrictions placed by the French government on parts entering that country made it necessary to manufacture entirely in that country the products of Ford, S.A.F., the French subsidiary. This program required so much additional capital that it was considered advisable to sell the majority interest to French concerns who are now responsible for providing the necessary manufacturing facilities.

In Italy, import duties were raised to prohibitive levels. The company continues to furnish parts for the Fords in circulation in that country, but the operations of its subsidiary show a loss during the past year of £20,755.

The other associated and subsidiary companies, with the exception of the Near East

branch at Istanbul, showed very satisfactory results. The Scandinavian recovery resulted in a dividend of 8 per cent paid by the Danish company, and one of 7 per cent by the Swedish, during the past year. The company in Holland paid a dividend of 12 per cent and the one in Belgium 25 per cent. The Spanish company also distributed dividends amounting to 25 per cent in 1934.

Profits from subsidiary companies other than the above were as follows: Rumania, £15,389; Greece, £8,960; Egypt, £29,397; and Irish Free State, £65,448.

Sir Percival complained that the British horse-power tax, which has been reduced only 25 per cent instead of abolished altogether as in most other countries, has interfered with the manufacture of the Ford eight-cylinder engine in England, with a consequent loss of business not only in that country, but in many export markets which would normally be served from Dagenham, and where the demand is for the higher powered car, rather than the one being produced. The chairman also complained that the large sums being derived from taxing the English motorist are being largely diverted, while much needed road improvements and extensions are delayed. While the per capita registration of motor cars is only one to 30 in England, as opposed to one to five in the United States, Great Britain has 13 cars for each mile of road, while in this country there are only 8.8. Fatal accidents in proportion to population are twice as numerous in England as in the United States.

Borg-Warner to Redeem 7800 Preferred Shares

Directors of the Borg-Warner Corp. have authorized the redemption of 7,800 shares of the corporation's preferred stock. The stock has a par value of \$780,000 and the company will pay \$107.50 per share plus any accrued dividends. The shares will be redeemed August 31 by lot drawing of certificate numbers from all outstanding stock at the close of business on July 14. Redemption of these shares will leave the corporation with 25,000 preferred shares outstanding with a par of \$2,500,000, according to officials.

April Excise Taxes Gain \$2,393,834 Over Year Ago

Total federal excise tax collections for April exceeded those for the same month of last year by \$2,393,834 according to the Taxation Committee of the AMA. The total for April of this year was \$18,725,976, while for the corresponding 1934 month they were \$16,332,142. April collections also rose \$1,098,881 above February of this year. The February total was \$17,627,094.

Included in the April collection total was \$3,052,098 on passenger cars; \$490,385 on trucks; \$10,438,843 on gasoline; \$1,305,889 on tires; \$2,749,287 on lubricating oils; \$353,304 on parts and accessories, and \$336,166 on inner tubes.

J. N. Willys Recuperating

John N. Willys, Toledo automobile manufacturer, who is ill at the Norton Memorial Infirmary, Louisville, is reported to be greatly improved by Mrs. Willys, who is with him at the hospital.

	April, 1935	March, 1935	April, 1934	Four Months, 1935	Four Months, 1934
Passenger cars—U. S. and Canada					
Domestic market—U. S.	368,617	337,088	....	1,176,326	....
Foreign market—U. S.	33,011	24,728	....	91,974	....
Canada	20,686	18,179	....	61,019	....
Total	422,314	379,995	303,806	1,329,319	906,927
Trucks—U. S. and Canada					
Domestic market—U. S.	57,416	58,008	....	221,013	....
Foreign market—U. S.	18,672	10,010	....	46,753	....
Canada	3,435	3,796	....	13,798	....
Total	79,523	71,814	67,532	281,564	218,422
Total—Domestic market	426,033	395,096	....	1,397,339	....
Total—Foreign market	51,683	34,738	....	138,727	....
Total—Canada	24,121	21,975	....	74,817	....
Totals—Cars & Trucks—U. S. and Canada	501,837	451,809	371,338	1,610,883	1,125,349

Used Car Situation Parallels 1930; Sales Rate Checks Inventory Growth

Stimulated by spring weather, used car sales in recent weeks have expanded sufficiently to check the growth in dealer inventories which had reached the highest level since 1930. While the positions of various dealer organizations differ, some showing increases, the industry as a whole did not add to its used car stocks in April.

So far as can be determined, the used car situation as yet has not materially affected new car sales, although there is evidence in certain quarters that it was beginning to retard sales and factory shipments. Sales executives realize that it is imperative to the soundness of the retail market that used car inventories be reduced at a substantial rate from the present level.

Close observers estimate current stocks at 460,000 to 475,000 units, or not over a month's supply at present rate of sales. With relation to turnover this is not considered a heavy stock, but taking into consideration the dealers' financial position it unquestionably has reached the caution point notwithstanding the practice which has become more or less widespread this year of floor-planning used cars. While, generally speaking, plenty of money is still available for financing dealer inventories of used cars, the brakes have been applied in some situations and more caution is being exercised.

Some dealer organizations in recent weeks have been averaging less than one used car sale to one new car sale, but the industry as a whole probably shows a much better ratio since some of the larger dealer bodies have been running nearly two for one. In the process of trading down, the number of deals that must be made before a dealer can realize full cash on a car taken in trade for a new car varies of course with the price; it also varies with the season and the territory. The same dealer body will show relatively wide variance in ratios from month to month but obviously the ratio must run better than one for one if used car stocks are not to accumulate. A minimum of 1.5 to one is considered by some as necessary for a healthy inventory position.

On the basis of current new car sales the estimate of roughly a month's supply of used cars in all dealers' hands assumes a ratio of around 1.4 to 1. The industry's new car sales so far in May have been running somewhat under the earlier peak which is estimated to have brought April volume in the domestic market to approximately 385,000 cars and trucks. In 1930, a year of comparable new car volume, used car stocks were upwards of 60,000 units higher.

Having reached heavy volume on new car deliveries early in the year, Ford dealers found their used car stocks rapidly mounting until by April 1 it is understood they had around a 45-day supply on hand, an uncomfortably large stock which caused both the company and dealers no little concern.

Used car sales in April picked up rapidly with the result that stocks were brought down to just a little over a month's supply. During April, however, used car sales picked up rapidly, dealers selling nearly two used for one new car, with the result that used car stocks were brought down to just a little over a month's supply. In certain territories, as Wayne County, where Ford has been doing about half of the new car business, dealers naturally have accumulated used car stocks that are considerably heavier than desired.

Chevrolet dealers disposed of around 40 per cent more used cars in April than new, and have well under a month's supply on hand. Dealers have been concentrating on their used car departments this month as result of the shortage in new car supplies caused by the strike.

In efforts to escape the restrictive effect which heavy used car inventories have on new car scales, manufacturers generally are giving close attention to the problem. By means of radio, newspaper advertising, promotion stunts and close supervision, factories are assisting dealers in accelerating the used car turnover. Ford Motor Co.'s national broadcasting programs and advertising campaigns are an example.

Ford Canadian Minimum Daily Wage Up to \$6

Wallace R. Campbell, president of Ford Motor Co. of Canada, Ltd., has announced that the minimum wage for Canadian Ford workers would be increased to \$6 per day, putting Canadian workers on a par with U. S. employees.

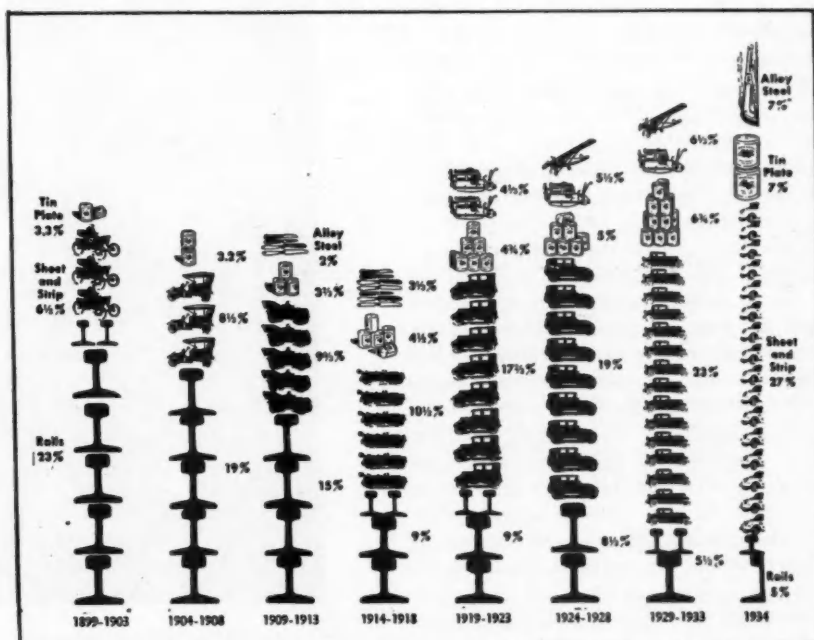
Ford Experiments With Used Car Reconditioning

Ford Motor Co. recently established a re-conditioning line in its Highland Park plant as an experimental plan to test out how much reconditioning should be given a used car before it is offered for sale. In other words the company starts with the theory that used car buyers are as desirous of dependable transportation as are new car buyers and has set out to determine just how much conditioning the buyer is willing to pay for. Used cars for the new reconditioning line are being supplied by some of the larger Detroit dealers. It is aimed to arrive at a standard practice and the experience gained in operation of the line will be passed on with recommendations to all Ford dealers. The line is operated solely as an experiment in the Detroit plant and probably will be discontinued as soon as it has served the purpose of developing the information sought.

Discharge Rate Halved in April From Year Ago

The automobile industry cut its discharge rate per 100 employees for April exactly in half from the corresponding period of 1934 the report of the Bureau of Labor Statistics for the month under review indicates. However, April's discharge rate was the highest of any of 12 principal industries studied. The Bureau's report on the automobile industry is shown in the accompanying table.

	April, 1935	March, 1935	April, 1934
Quit	1.61	1.61	3.31
Discharge .....	.37	.28	.74
Lay-off	2.28	2.57	4.66
Total separation	4.26	4.46	8.71
Accession	5.32	5.26	11.77



Courtesy of Steel Facts

Each of these developments is reflected in the shifting demand for products of the steel industry, with automotive buyers accounting for a constantly increasing share of the total.

NRA Decision Kills Codes, Shrivels Legal Basis for Wagner, 30-Hr. Bills

Some, but not all the doubts, regarding what phases of business activity are subject to federal regulation under the commerce clause were cleared up on Monday of this week when the United States Supreme Court ruled in the Schechter poultry cases.

The Court wiped out the entire code structure—hours, wages, Section 7a and trade practices—by holding that in enacting the Recovery Act, Congress had unconstitutionally delegated its legislative power to the President, and further that efforts to regulate hours and wages of employees engaged in intrastate commerce *not directly* affecting interstate commerce were beyond the scope of federal power.

Whether wages, hours and employer-employee relationships in manufacturing enterprises whose products are sold in interstate commerce are subject to federal regulation was not decided by the Court since the issue was not before it. Consequently speculation is rife as to the constitutionality of the Wagner, 30-hour and other bills and as to any legislation which Congress might pass to fill the gap left by the demolition of the Recovery Act.

However, those who contend that the Wagner and 30-Hour Bills are constitutional despite the NRA decision were given something to ponder in the quotation the Court made from a previous decision involving an alleged conspiracy in violation of the anti-trust act. The Court said "The alleged conspiracy and the acts here complained of spent their intended and direct force upon a local situation—for building is as essentially local as mining, manufacturing or growing crops—and if, by resulting diminution of commercial demand, interstate trade was curtailed either generally or in specific instances, that was a fortuitous consequence so remote and indirect as plainly to cause it to fall outside the reach of the Sherman Act."

There doesn't seem to be much comfort in this quotation for those who argue that wages, hours, collective bargaining, etc., in manufacturing plants selling their products in other states, have a sufficiently direct effect on interstate commerce to put them within the federal power. In fact, the implication seems to be that wages, hours, collective bargaining, etc., in manufacturing plants selling in interstate commerce, have so indirect an effect on such commerce, that they cannot be brought under federal law constitutionally.

The decision did make it abundantly clear that business which sells within a

state is not subject to federal regulation unless it *directly* affects interstate commerce, even though it may buy from suppliers in other states. So far as the automotive industry is concerned, this means obviously that manufacturers, wholesalers and dealers who sell to buyers within the same state are beyond federal control, unless a direct effect of their operations on interstate commerce can be shown, despite the fact that they may buy materials, vehicles or parts from manufacturers in other states. Particularly, the regulation of hours, wages and fair trade practices attempted in the automotive wholesale and motor vehicle retailing trade was for the most part, if not entirely, unconstitutional.

On this point the Court said in part: "If the commerce clause were construed to reach all enterprises and transactions which could be said to have indirect effect upon interstate commerce, the federal authority would embrace practically all the activities of the people and the authority of the State over its domestic concerns would exist only by sufferance of the federal government."

The Court's argument on the delegation of legislative power is of primary interest to lawyers. Briefly, it was held that in view of the scope of the broad declaration of policy in the Act, and of the nature of the few restrictions imposed, the discretion of the President in approving or prescribing codes, and thus enacting laws for the government of trade and industry, is virtually un-

fettered. This code making authority was declared an unconstitutional delegation of power.

The government contention that the emergency required action along the line taken was met with the statement that "extraordinary conditions do not create or enlarge constitutional power." Similarly, the argument that federal legislation was necessary because individual states could not afford to legislate high labor standards because they would lose business to states not having such laws, was answered as follows: "Without in any way disparaging the motive, it is enough to say that the recuperative efforts of the federal government must be made in a manner consistent with the authority granted by the Constitution."

John C. Wetmore

John Chetwood Wetmore died this week at his home in Los Angeles. Mr. Wetmore was 78 years old. He was one of the pioneer automobile journalists and for 20 years was automobile editor and automobile advertising manager of the New York Evening Mail, succeeding Alfred Reeves, AMA vice president and manager. Mr. Wetmore retired from active newspaper work some years ago and with his family went to the Pacific Coast city to live. There he represented the Automotive Daily News.

Commenting upon Mr. Wetmore's death in a telegram to *Automotive Industries* Mr. Reeves said: "It is saddening to learn of the death of John C. Wetmore, because it means the passing of one of the outstanding personalities in the development of the motor industry. His loss will be felt by many leaders in the motor industry whose friendship, respect and confidence he had earned during years of loyal service to the industry. He will be remembered by many as one who,



H. G. Moock, Plymouth vice-president, with some of the 44 Detroit school boys of the school safety patrol who will be taken on a five-day tour of Washington by Plymouth organization as a reward for their vigilance on duty

by his writings and addresses, made an outstanding contribution to the field of automobile journalism. His record as automobile editor of the New York Evening Mail for 20 years and later as Los Angeles representative of the Automotive Daily News reveal many evidences of his never failing optimism, his aggressive Americanism and his devotion to worthy causes. It was a rare privilege to have enjoyed the friendship of such an ideal citizen and lovable gentleman."

NRA Decision Increases Doubts About ALB Future

As a practical factor in the industry's labor relations, the influence of the Automobile Labor Board appears to be definitely waning if it isn't verging on an end, even though the Board may be continued in existence for some time.

Since the American Federation of Labor repudiated it, the Board has been the subject of steady attacks by labor leaders who are determined to carry on organization outside of ALB supervision and to negotiate directly with management on working conditions, seniority, discrimination, etc., without the assistance of the Board. The manner in which the Toledo Chevrolet strike was settled was a heavy blow—some describe it as a death blow—to the Board's prestige and in the minds of many the Board's usefulness ended at that time.

Now the NRA decision has raised doubts as to the legal basis for continuing it and also for financing it. Certainly, if it is concluded that it grew out of and is a part of the code structure, there would seem to be little reason to doubt that its life ends June 16 at the latest.

On the other hand, it is contended with considerable justice that it was originally created outside of the automobile manufacturing code by the settlement the President negotiated with the AMA and the AFL. On this basis, the technical status of the Board would not be affected by the demise of the code, since it was established by voluntary agreement without any relation to the code.

However, looking at the situation realistically, the repudiation of the Board of the AFL, one of the parties to the settlement, makes it necessary to view this brand of logic with some suspicion, particularly so far as the practical functioning of the Board is concerned.

Byrd Sees Democratic Control the Only Sound Basis for Better Labor Relations

by Richard L. Byrd

Member of the Automobile Labor Board

The only sound foundation for improving industrial relations is an increasing democratic control of industrial employees affairs. The establishment of safeguards for democratic control is the chief function of any agency which would create more satisfactory employee-employer relationships than have existed in the past. Any employee representation plan or system in which the free control is not vested in and guaranteed to the great body of employees, will develop a despotism upon those employees which can only create greater dissatisfaction and ultimate repudiation by them. This is the fundamental fallacy of the so-called company union and of those so-called outside unions which are constitutionally or by decadence of a despotic nature.

The thinking employers and employees recognize the truth of these assertions and, consequently, come what may in the form of legislation or its abolition, I am confident that any competent agency which promotes democratic relationship of employer and employee will continue to live—in some form. The principle of democracy is sound and is the only principle upon which society can base a generally acceptable progress. Dictatorship, whether it be political, economic or social, must eventually be cast aside.

On the other hand, democracy can grow in its scope and usefulness only as the masses of our people are increasingly informed regarding the truth about issues, principles, and circumstances pertaining to their welfare. Democracy fails in the degree to which its constituents are uninformed. Dictatorship prospers as democracy fails and for the same reasons.

It is, therefore, incumbent upon all the people of any industry to find ways and means of securing the most accurate information and the most democratic control if they would create a satisfactory employee-employer relationship.

These conditions will eventually be developed in the automobile manufacturing industry to a state of perfection which could not have been hoped for under antiquated ideas. The experiment, looking toward a better solution for the labor problems of this industry, is only begun. I do not foresee its collapse.

Further, if the NRA decision means that wages, hour and collective bargaining in manufacturing plants are beyond federal control, and the decision may be read to support this view, then even if the Board continues, the scope of its operations would be seriously curtailed.

NADA Directors Meet

The board of directors of the National Automobile Dealers Association is scheduled to meet in St. Louis on Friday and Saturday of this week. According to F. W. A. Vesper, president, an attempt will be made to carry on the principles of the code under a voluntary agreement. It is understood that there is a feeling that decisions of the Federal Trade Commission affecting other industries with the trade-in problem warrant hope that some legal form of used car control can be established.

ICC Bars Allowances For Private Switch Facilities

The Interstate Commerce Commission has ruled that the practice of rail carriers who pay shippers to operate their own switching facilities is illegal and has ordered approximately 200 industrial plants, among them the Ford Motor Co., to cease and desist on or before July 15 of this year.

The Commission's decision held that delivery on interchange tracks near such factories constituted deliveries under the line-haul rates and that allowances by railroads for private switching charges "dissipates respondents' funds and revenues."

Law Quarterly Devoted to Instalment Selling

Discussions of various phases of instalment selling make up the entire content of the April issue of Law and Contemporary Problems, a quarterly publication of the Duke University School of Law. Declaring that attention is focusing on the operations of the business, such questions as whether this form of credit functions satisfactorily, whether its costs are reasonable and whether existing laws adequately protect buyers and sellers, are discussed in the publication.

Correction in Hudson Table of Prices

The second and third columns of the Hudson price table on Page 686 of *Automotive Industries* of May 25, should have been headed Special 8 instead of Special 6. There is no Special 6 in the Hudson line.

CALENDAR OF COMING EVENTS

SHOWS

Machine Tool Show—Cleveland..Sept. 11-21
New York Automobile Show, New York, Nov. 2-9
Detroit Automobile Show.....Nov. 9-16
Buffalo Automobile Show.....Nov. 9-16
Cincinnati Automobile Show.....Nov. 10-16
Automotive Service Industries Show—Atlantic City.....Dec. 9-13

CONVENTIONS AND MEETINGS

S.A.E. Summer Meeting—White Sulphur Springs, Va.June 16-20
American Society for Testing Metals, Detroit.....June 24-28
National Industrial Advertising Association, Pittsburgh.....Sept. 18-20

American Transit Assoc., Bus Division, Atlantic City.....Sept. 23
National Assoc. Sales Finance Cos.—White Sulphur Springs.....Sept. 26-28
American Society for Metals, Annual Meeting—Chicago.....Sept. 30-Oct. 4
National Safety Council, Louisville, Ky.October 14-18
American Gas Association—Atlantic City.....Oct. 14-18
Los Angeles.....Nov. 2-9
Newark, N. J.Nov. 9-16
American Petroleum Institute—Los Angeles.....Nov. 11-14
Philadelphia.....Nov. 11-16
Baltimore.....Nov. 16-23
National Industrial Traffic League—Chicago.....Nov. 20-21
Columbus, Ohio.....Nov. 23-28

Independent Suspension Adopted on All New European Race Cars for 1935 Events

by W. F. Bradley

Paris Correspondent for Automotive Industries

Independent wheel suspension now finds a place on every European racing car built for this season's events, or under construction. Germany led the way in this respect, when last year she produced the Mercedes-Benz and the Auto Union cars. The former make use of coil springs, with a parallelogram attachment to the frame, the system being practically identical with that used on the firm's stock cars.

Auto Union employed torsion bar suspension in front and a very broad transverse spring at the rear. The rear suspension, however, was adopted to save time, Engineer Porsche's idea being originally to use torsion bar suspension all round.

In view of the higher speed of the German cars, the Italians were obliged to build new cars and to modify the existing models. Under the international racing rule applied in Europe, the only restriction is a maximum weight of 1653 lbs. empty, with the wheels, but without tires. When first applied, this rule kept piston displacement below 183 cu. in. By new design and particularly by the use of light alloys, the German firms were able to push piston displacement up to 300 cu. in. and still remain within the maximum weight limit.

Independent wheel suspension only entered indirectly into the problem, which was one of power-weight ratio, but in view of the better road holding ability of the new German cars and the reduced tire wear, it was forced on the Italian makers.

Alfa Romeo has taken up the Dubonnet system, used in the United States by Chevrolet and Pontiac, the suspension being mounted at the ends of a tubular front axle, which is attached to the ends of the two side rails by means of slips and four bolts. A friction type shock absorber is incorporated with the suspension, forming a part of the same housing, to the rear of the axle.

For record attempts, and for open races in which the international weight limit is not applied, Alfa Romeo has produced a couple of cars with two eight cylinder motors, one in front of the driver and the other to the rear. The transmission is in the center and the drive is to the rear wheels only.

The motors have a bore and stroke of 68 by 100 mm., giving a total piston displacement of 5810 cc. (354 cu. in.). It is claimed that these motors develop 90 h.p. per litre, which gives a total of about 540 h.p. In straightaway runs a speed of 210 miles an hour has been attained, with Tazio Nuvolari driving.

Like the other Alfa Romeo cars, this two engine job has dual drive shafts, coming diagonally from the transmission, the crown wheels being close to the driving wheels. At the front a tubular axle with Dubonnet suspension is made use of. At the rear there is a full axle with flexible quarter elliptic springs, having their attachment very close to the driving wheels.

These two Alfa Romeo models are really

temporary jobs, to be used only until the entirely new cars are ready. It was expected that these would be out by June, but a delay is probable. The new models will have independent suspension all round.

Maserati has produced new jobs, the most important of which has an eight cylinder V motor of 268 cu. in. Torsion bar suspension is used, all four wheels being sprung independently. The value of the new Italian solutions remains to be proved, but in the only race held this season, at Monte Carlo, Mercedes-Benz had an easy victory. The Alfa Romeos were held back by defective details of their hydraulic brakes.

Third Quarter Steel Prices Are Unchanged

Automotive Shipments Show Little Effect of Monday's NRA Decision

The Supreme Court's NRA decision caused a halt in the steel market pending some indication of the form the generally expected substitute legislation will take. While shipments of steel to automotive consumers were not affected by this development, recrudescence of labor troubles in the automobile industry caused renewed uneasiness among steel company executives. The volume of fresh buying had receded sharply before the Supreme Court's decision had become known. This was hardly caused by expectation on the part of buyers of lower prices.

With third quarter prices definitely unchanged and advances impossible under the code until late in August, there was little incentive for buyers to

order tonnages beyond their current needs. The policy of holding commitments down to immediate requirements was largely prompted by a desire to adjust material purchases to prevailing conditions in the automobile market. Steel producers point out that, when the higher freight costs absorbed by them are taken into consideration, third quarter prices really represent a slight reduction. In the market for full finished sheets there is still much irregularity in the price of seconds. These did not come under the code, and by many have been claimed to be an upsetting factor, the charge being frequently made that here and there full quality sheets had been sold as seconds to exempt transactions in these from code rules.

Alloy steels fared well in the first four months of this year, the head of a company specializing in nickel-chromium steels having recently declared that 1935 had brought them the greatest volume of business since 1930 and that they now employ as many men as they did at the peak in 1929.

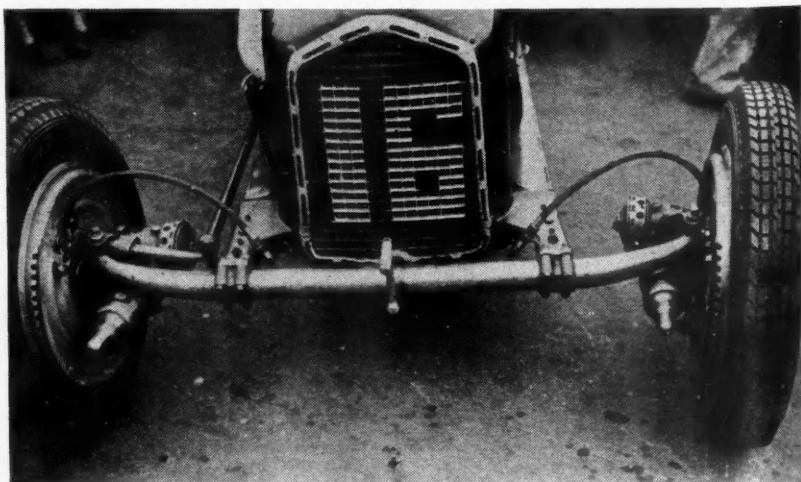
Pig Iron—Mild slowing down of demand from automotive foundries had been in evidence in most of the markets before the Supreme Court's NRA decision brought a temporary halt to business, as it did in the steel market. Blast furnaces sales agents look for melters to buy iron, as they will need it, over the next few months.

Aluminum—Slightly higher prices are quoted for certain grades of secondary zinc-containing silicon alloys. Prices for remelted No. 12 alloy are fractionally lower for certain grades. The market for primary metal remains nominally unchanged.

Copper—Higher prices for export copper have raised the hopes of producers that before long domestic prices can also be advanced with safety. In proposed substitute legislation for the NRA, it is emphasized that the products of natural resources be exempted from any taboo against price-fixing.

Lead—Lead prices again moved higher at the beginning of the week, the leading interest raising its contract price \$2 a ton to 4.35 cents, New York, the advance in the last month aggregating \$12 a ton.

Zinc—Labor disturbances in the Oklahoma mining district plus good demand make for a stronger undertone.



The latest Alfa Romeo Racing car with the Dubonnet independent front suspension system. This type of suspension is used on Chevrolet and Pontiac cars in this country.

SAE Summer Meeting Program

Sunday, June 16

6:30 P. M. **30th Anniversary Dinner**
 PRESIDENT W. B. STOUT, Toastmaster
 A gala banquet—a fitting celebration to start the 30th Anniversary Meeting—Past-Presidents will be the guests of honor—come early and truly enjoy a most unusual start of a very interesting Summer Meeting

followed by
 Business Session
 W. B. STOUT, Presiding

Monday, June 17

9:30 A. M. **Transportation and Maintenance**

T. C. SMITH, Chairman
 What's the Destination for Motor Transportation?—A. M. WOLF, Automotive Consultant, New York

9:30 A. M. **Aircraft-Engine**
 P. B. TAYLOR, Chairman

The N.A.C.A. Investigation of Cowling and Cooling of Radial Air-Cooled Engines—CARLTON KEMPER and D. H. WOOD, National Advisory Committee for Aeronautics

Further Progress in Controlled Cooling of Radial Aircraft Engines—J. M. SHOEMAKER, Chance Vought Corp.; T. B. RHINES, United Aircraft Corp.; and H. H. SARGENT, JR., Pratt & Whitney Aircraft Co.

Evaluation of Variables Influencing Air Cooling of Engines—KENNETH CAMPBELL, Wright Aeronautical Corp.

2:00 P. M. **Aircraft-Engine**
 ROBERT INSLEY, Chairman

Bringing the Italian Sky Down to Earth—M. E. MERRIMAN, Representative of Fiat, Detroit

Comparison of Spark and Compression Ignition Engines for Aircraft Service—KENNETH A. BROWNE, Wright Aeronautical Corp.

8:00 P. M. **Aircraft**
 C. H. CHATFIELD, Chairman

Flying The Lindbergh Trail—Sound Movies, courtesy Pan-American Airways, Inc.

10:30 P. M. **Water Carnival**

Tuesday, June 18

9:30 A. M. **Truck, Bus and Railcar**
 L. R. BUCKENDALE, Chairman

Diesel Power for Transportation—O. D. TREIBER, Hercules Motors Corp.

Motion pictures of Truck Operations at Boulder Dam

9:30 A. M. **Aircraft**
 P. ALTMAN, Chairman

Design Problems and Methods for Large Flying Boats—I. I. SIKORSKY, Sikorsky Aircraft Corp.

The Work of the N.A.C.A. Tank—STARR TRUSCOTT, National Advisory Committee for Aeronautics.

2:00 P. M. **Aviation Demonstrations**

8:00 P. M. **Passenger Car**
 L. P. KALE, Chairman

Stresses in Connecting-Rods and Bearings—W. R. GRISWOLD, Packard Motor Car Co.

Engine Knock Studied by Electro-Acoustical Instruments—NEIL MACCOULL, The Texas Co., and G. T. STANTON, Electrical Research Products, Inc.

Wednesday, June 19

9:30 A. M. **Passenger Car**
 C. R. PATON, Chairman

Mechanical Mind Reading (Transmissions)—JOHN SNEED, Sneed Engineering Corp.

"Sky Hooks" for Automobiles (Suspensions)—W. S. JAMES, Studebaker Corp.

9:30 A. M. **Diesel-Engine**
 L. C. LICHTY, Chairman

Analysis of Surges in Fuel Injection Pipes—K. J. DE JUHASZ, The Pennsylvania State College.

Performance of High-Speed Compression-Ignition Engines with Three Types of Combustion Chambers—ERNEST WHITNEY, National Advisory Committee for Aeronautics

2:00 P. M. **Field Day**

8:00 P. M. **Tractor and Diesel**

C. L. CUMMINS, Chairman
 Agriculture and the Automotive Development—C. D. WIMAN, Deere & Co.
 Diesels on Canadian Roads—H. L. WITTEK, Consulting Engineer, Toronto

Thursday, June 20

9:30 A. M. **Passenger Cars and Bodies**
 W. C. KEYS, Chairman

Cellular Rubber Cushions the Car—H. E. ELDEN, Dunlop Tire & Rubber Co.

Discussion on Body and Material Features—W. B. STOUT, Stout Engineering Laboratories

9:30 A. M. **Fuel Volatility**
 H. F. HUF, Chairman

A Forgotten Property of Gasoline—J. O. EISINGER and D. P. BARNARD, Standard Oil Co. of Indiana

Economics of Fuel Volatility—H. W. FIELD and M. J. FOWLE, Atlantic Refining Co.

Fuel Volatility Limitations Imposed by Vapor Lock—NEIL MACCOULL and E. M. BARBER, The Texas Co.

What Price Dynamite?—C. H. JORGENSEN, Delco-Remy Corp.

Trends in Automobile Design as Influenced by Fuel Volatility—J. M. CAMPBELL, W. G. LOVELL and T. A. BOYD, General Motors Corp.

(Some of these papers and some discussion may be carried over to Friday morning.)

8:00 P. M. **General**
 A. L. BEALL, Chairman

Railroad Equipment Possibilities—J. B. EASTMAN, Federal Coordinator of Transportation

10:30 P. M. **Grand Ball**

Friday, June 21

9:30 A. M. **Fuels and Lubricants**
 D. P. BARNARD, Chairman

Report of Extreme Pressure Lubricants Subcommittee—W. S. JAMES, Studebaker Corp.

(Some papers and some discussion may be carried over from the Thursday morning Fuel Session.)

COMMITTEE MEETINGS

Sunday—June 16

9:30 A. M. Brake Committee
 12:00 Noon Council
 2:00 P. M. Ignition Research Subcommittee

Monday—June 17

8:00 A. M. Membership and Sections
 8:00 A. M. Aircraft Engine Activity
 12:00 Noon Transportation and Maintenance Activity
 12:00 Noon C.F.R. Aviation Gasoline Detonation
 2:30 P. M. Highway Research Subcommittee
 6:30 P. M. Truck, Bus and Railcar Activity

Tuesday—June 18

8:00 A. M. Motor Vehicle Design
 8:00 A. M. Passenger Car Activity
 12:00 Noon Publication Committee

12:00 Noon Motor Truck Rating
 12:00 Noon Aircraft Activity
 4:30 P. M. Oiliness Research Subcommittee

Wednesday—June 19

8:00 A. M. Riding Comfort Research Subcommittee
 8:00 A. M. Meetings Committee
 12:00 Noon Diesel Engine Activity

Thursday—June 20

8:00 A. M. Standards Committee
 8:00 A. M. Passenger-Car Body Activity
 8:00 A. M. Front Wheel Alignment
 12:00 Noon Fuels and Lubricants Activity
 2:00 P. M. E. P. Lubricants Research

Friday—June 21

12:00 Noon Research Committee

Study of Securities Act Issued by Trade Editors

A comprehensive study of the Securities Act of 1933 has been made and published in pamphlet form by the Committee on Financial Legislation of the National Conference of Business Paper Editors and the Associated Business Papers, Inc. Divided into several phases the study covers such topics as the effect of the Act on financing; com-

parison of the United States Act and the English law; the deterrent effects of the Act; the opinions of underwriters and experts concerning the measure, including the bankers' viewpoint, the legal viewpoint and the accountants' view of the law.

Robert Conrad

Robert Conrad, for 30 years editor of Der Motorwagen, Germany's leading technical automotive publication, and more recently

joint publisher of the Automobiltechnische Zeitschrift, successor to Der Motorwagen, is dead. In this country Conrad probably was known best as inventor of the Conrad ball bearing, an annular bearing.

Mr. Conrad entered the automobile industry in 1897 as chief engineer of the Berlin Motor Vehicle and Motor Works. Later he established a plant for the manufacture of ball bearings, and after the war he developed a consulting-engineering practice. He was 65 years old.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for Automotive Industries

Wholesale and retail trade was retarded last week by cool weather, but there was an upturn in some branches of industrial activity. Commodity markets were quiet, with fluctuations within narrow limits.

Guaranty Trust Index

The Guaranty Trust Company's index of business activity for April stands at the preliminary figure of 71.4, as against 74.3 for March and 73.1 for a year ago. The Company's index of wholesale commodity prices on May 15 was 54.2, as against 53.1 a month earlier and 53.5 a year earlier.

Increased Freight Loadings

Railway freight loadings during the week ended May 18 totaled 583,327 cars, which marks an increase of 8,142 cars above those in the preceding week, a decline of 29,004 cars below those a year ago, and an increase of 47,608 cars above those two years ago.

Current Output Gains

Production of electricity by the electric light and power industry in the United States during the week ended May 18 was 3 per cent above that in the corresponding period last year.

Life Insurance Sales Up

Sales of ordinary life insurance during April were below those a year ago, but sales during the first four months of this year were 8 per cent above those in the corresponding period last year. The moderate decrease last month was noticed in all sections of the country.

Building Contracts Lower

The value of construction contracts awarded in 37 eastern States, according to the F. W. Dodge Corporation, amounted to \$124,284,600, as against \$131,157,000 in the corresponding period last year. There was a substantial increase in the value of residential building, as compared with that a year ago.

Factory Employment Better

There was an increase of 0.6 per cent in New York State factory employment during the 30-day period ended April 15, while total wage payments decreased by 0.3 per cent.

Fisher's Index

Professor Fisher's index of wholesale commodity prices for the week ended May 25 stood at 82.7, as against 82.3 the week before and 82.2 two weeks before.

Federal Reserve Statement

The consolidated statement of the Federal Reserve banks for the week ended May 22 showed no changes in holdings of discounted bills, bills bought in the open market, and government securities. Money in circulation declined \$13,000,000 and monetary gold stocks increased \$25,000,000.

day of last week signed an order on petition of Mr. Andrews and Frederick Dodge, a former director, restraining the new board of directors from taking any steps which might lead to seizure or sale of assets and from abrogating any contracts in the New York district. Judge Knox's order remains in effect until the return of a show-cause order also obtained by Mr. Andrews and Mr. Dodge, who ask that Mr. Drake and other members of the new board be restrained from acting as corporation officers. Attorneys for the new directors are seeking to determine whether Judge Moinet's order supersedes that issued by Judge Knox.

Mr. Andrews, it is said, has asserted in an affidavit that he offered to resign as board chairman if Mr. Drake withdrew his receivership suit. It is claimed Mr. Drake did not withdraw the suit, and that it was followed by a Stock Exchange action tending toward delisting of Hupp stock from the big board. The new board, it is charged, has violated its agreement by withdrawing an application for a \$2,000,000 RFC loan and failing to oppose delisting of Hupp stock at hearings before the Securities Exchange Commission. Mr. Andrews is reported to have asserted that legally the board of the company is composed of himself, Mr. Dodge, Frank S. Lewis, Frederick Cardway, Thomas Bracken, William G. Fitzgerald, Louis Herbert and Emlen Hare.

First V-8's Shipped From Rouge in Boats by Ford

More raw materials, finished cars and parts will be moved by ship during the navigation season of this year by the Ford Motor Co. than were shipped last year, the company has announced. The company's entire fleet is now in operation and for the first time V-8 cars and trucks are being loaded at the Rouge plant on specially equipped boats for automobile carrying. Several ships in this service have capacities for 400 to 450 cars at a cargo.

Estimated freight movement in the company's own boats include 1,400,000 tons of coal; 500,000 tons of iron ore; 250,000 tons of sand; 200,000 tons of limestone and 15,000,000 board feet of lumber. About 100,000 tons of cars and parts will be moved this year by the company's ships.

The Ford fleet includes two of the largest motor vessels on the Great Lakes, the Henry Ford, II, and the Benson Ford, ore carriers. In foreign service is the 10,000 ton motor ship, East Indian, now enroute from Buenos Aires to Boston, New York and Philadelphia; three motor ships operating between Norfolk, Va., and Jacksonville, Fla.; two oil-burning steamers operating between Chester, Pa., and west coast branches, and several coal barges and two turbine driven canal boats which operate between Edgewater, N. J.; Chester, Pa., and the Rouge, carrying parts and supplies.

Fulton Enlarges Plant

Fulton Co., 1912 South Eighty-second Street, West Allis, Milwaukee, manufacturers of automotive parts and accessories, is enlarging its plant to gain additional space for paint and spray rooms

Andrews-Drake Row Flares in 2 Courts

Hupp Directors Seek to Restrain Each Other From Official Corp. Activity

A temporary restraining order was issued Monday by Federal Judge Edward J. Moinet prohibiting Archie M. Andrews, former Hupp chairman, from representing himself as chairman, from interfering with the new board and company officials, from saying he has authority to act for the corporation and from attempting to secure money from the corporation.

Petition for the injunction was filed by J. Walter Drake, director of the new compromise board and one-time chairman. The injunction will continue until hearings have been held on Mr. Drake's suit to oust Mr. Andrews, instituted March 21 and which had not been withdrawn.

Judge Moinet also ordered an affidavit of

prejudice filed against him by an attorney for Mr. Andrews stricken from the records, holding that the affidavit failed in numerous particulars to comply with the statute, specifying in particular that it had not been filed by counsel of record.

Protected by the temporary injunction, the new Hupp board met Tuesday and appropriated \$100,000 from the corporation's funds for payment of past due debts amounting to \$235,000. The company reports that its business has been holding up well, factory sales of 100 cars being made on Monday. Production has been averaging around 85 cars a day and should total approximately 1,700 for the month.

Vern Drum, president, announced that the new board re-elected Wallace Zwiener treasurer. Mr. Zwiener, who formerly was comptroller of Continental Motors, had held the Hupp treasury post from November, 1934, to March this year, when the factional dispute which enmeshed the corporation came to a head resulting in numerous personnel changes.

Federal Judge John C. Knox on Thurs-

Coughlin Broadcast Criticism of Dealer Contracts Follows Contacts with NADA

Father Coughlin offered himself as a shepherd of automobile dealer discontent in his radio broadcast last Sunday, in which he declared that one-sided dealer contracts insure profit for the manufacturers at the expense and often times loss of little business among automobile dealers.

The attack on the industry's distribution practices came after a conference (or conferences) between Father Coughlin and representatives of the National Automobile Dealers Association. It is understood that the radio priest asked for the answers to a number of questions and that he was also supplied with copies of the survey of dealer operations made by the Pennsylvania Automotive Association and with copies of dealer contracts.

Queried regarding NADA's connection with the broadcast, Jack Frost, assistant to President Vesper, telegraphed *Automotive Industries* as follows: "We were asked if dealers could obtain credit through regular channels meaning banks. We replied that in any large sense they could not. We asked Coughlin if and when he attacked NRA to kindly make an exception of the dealers' code."

In Detroit a local dealer who said that he had acted as an intermediary because of his acquaintance with Father Coughlin, told *Automotive Industries* that he had arranged the conference at the request of NADA representatives. He stated that he didn't know what had come of their conference and that he had not heard the broadcast.

According to Father Coughlin's secretary, however, the meeting was initiated by the radio priest.

Reorganize Lauson Co.

John Lauson Mfg. Co., New Holstein, Wis., one of the earliest manufacturers of gasoline engines in the northwest, is being

completely reorganized under the direction of Henry S. Wright, Milwaukee, who will become president. A new company, titled Lauson Co., is being formed, following acquisition of the assets by Mr. Wright and his associates. F. H. Edson will be vice-president in charge of sales; C. O. Piper, vice-president in charge of production.

Graham Promotes Thoms to Districts Director

Lansing W. Thoms, for years active in the automotive sales field and until recently Boston district manager for Graham Paige,

has been appointed director of districts for the company, it was announced by Robert C. Graham, executive vice-president.

Mr. Thoms will have supervision of all district managers for Graham and will take an important part in the company's program which seeks to double sales.

Chrysler Canadian Sales Up 44% in First 4 Mos.

J. D. Mansfield, president of the Chrysler Corporation of Canada, Ltd., Windsor, Ont., has reported substantial increases over the past three years. April of this year was the biggest month since April, 1929, Mr. Mansfield said. Shipments of 1935 models to date are 44 per cent greater than shipments of 1934 models for the same period last year; unfilled orders are reported to be 88.3 per cent greater now than on May 1 of last year.

Chrysler Adds Eight DeLuxe Models to Airstream Eight; Price Based at \$930

The Chrysler Sales Corp. has added a line of eight de luxe models to its Airstream Eight series with a base price of \$930.

There are six body styles on a wheelbase of 121 in. with 105 hp., and two body styles on a 133-in. wheelbase with 110 hp.

The several body styles and prices are as follows: Business coupe, \$930; rumble seat coupe, \$955; touring brougham, \$980; four-door sedan, \$985; four-door touring sedan, \$1,015; convertible coupe, \$1,015; seven-passenger sedan (133-in. wheelbase), \$1,235; traveler sedan (133-in. wheelbase), \$1,235.

Among the exterior features of the cars are: New-type headlights, mounted

on the side of the radiator, and new fender guide lights that are contoured to conform with headlight appearance. New dual horns are mounted directly below the headlights in the "catwalk" between the fender and the radiator.

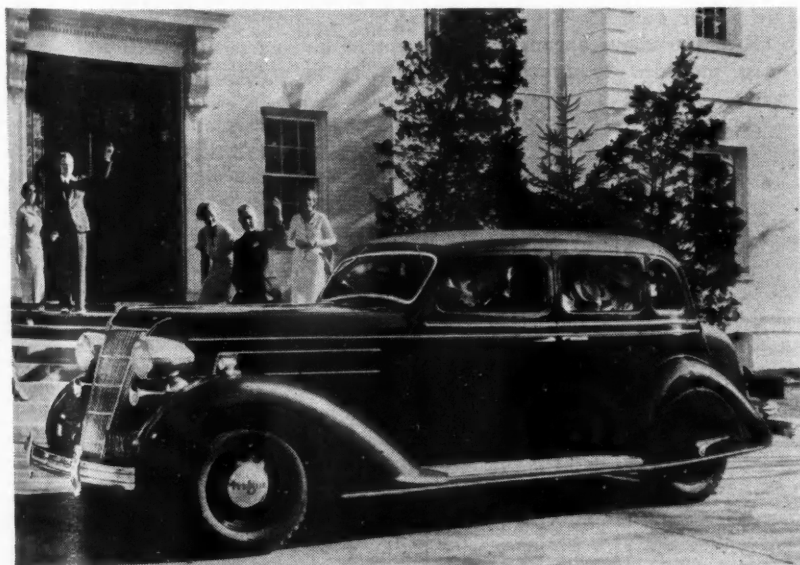
A new radiator has been adopted, with chrome shell and Velchrome grill. New rubber safety treads are inclosed in chromium bands on the running boards. An ornamental "8" has been added to the louvers and to the new embossed hub caps. Rear wheel shields and painted sheet metal are now standard equipment.

Inside, the seats are placed at a new angle, and either broadcloth or mohair trim is available. All models are fitted with arm-rests in both front and rear compartments. Front doors have pull-to cords. Sedan models have two foot-rests in the rear compartment and a robe cord. Two assist cords and a dome light are included in the rear compartment appointments. A new and improved luggage compartment located behind the rear seat is a feature of the sedan.

In the 133-in. sedan and seven-passenger sedan models each of the two rear-seat arm-rests is equipped with ash receivers and a pocket for small personal items, such as vanity and cigarette cases. Two reading lights are located in the coved ceiling between the rear quarter and rear windows. These supplement the dome light. In the traveler sedan extra space for small parcels is found in two generous compartments built into the base of the front seat.

In the seven-passenger sedan and traveler sedan, the front door measures 41½ in. at the bottom, and the rear door 26 in. at the bottom. Floor space in the rear compartment of the traveler sedan measures 48¼ in. from the front of the back seat to the back of the front seat in its middle position.

Floor space in the rear compartments of the seven-passenger sedan measures 52 in. from the front of the back seat to the back of the front seat. Auxiliary seats are 19½ in. wide.



One of the new deluxe Chrysler Airstream Eight models

AS A MIXTURE CONTROL THE NEW PRATT & WHITNEY DEVICE

1. Maintains the air entering the carburetor at constant density and causes the carburetor to produce a mixture of practically constant fuel-air ratio throughout the normal operating range.
2. Above the critical altitude of the regulating device, enriching with increase in altitude is similar to that with normal carburetion. Within the altitude range used for normal commercial operation the enrichment above the critical altitude will not exceed the best power mixture strength. Inasmuch as operation above the critical altitude of necessity entails a reduction of the full throttle horse power, the hourly fuel consumption will decrease.
3. For military work or other work requiring ascent to higher altitudes a manual mixture control should be provided.
4. A more desirable shape of fuel curve for critical altitude is obtained than with a self-compensating mixture control applied to a standard carburetor, because the fuel-air ratio is the same at part throttle and full throttle.

WHEN THE DEVICE IS USED AS A POWER CONTROL

1. With a constant-speed propeller, power regulation equivalent to that with any device maintaining constant manifold pressure is obtained. Such regulation is more satisfactory than that obtained with a throttle stop or gate.
2. With a two-position or fixed-pitch propeller, power regulation slightly inferior to that available with constant manifold pressure is obtained, due to changes in manifold pressure with changes in R.P.M. The result however, is still superior to that available with a throttle stop.
3. For commercial or military operation, where an extended cruising range with limited maneuverability is desired, this device offers an excellent solution.

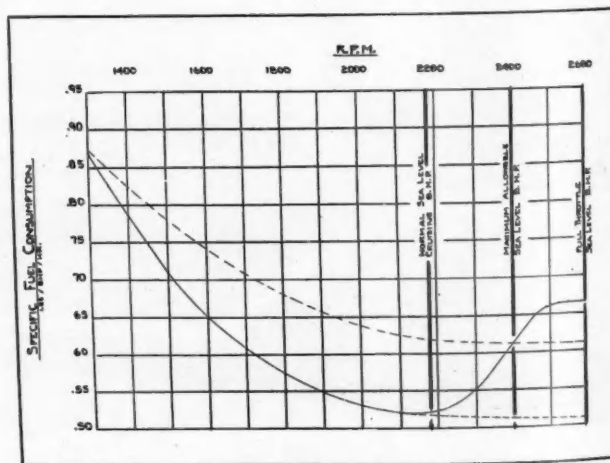
WITH the advent of the constant-speed (variable-pitch) propeller, the method formerly used to determine proper mixture-control settings became impractical, unless provisions were made for locking the propeller in one pitch setting to permit mixture adjustment.

Now that so many current models of aircraft engines are of the supercharged type, with which full-throttle operation is not permitted below a specified altitude, it is important that some method of limiting this power be provided. Supercharger pressure gages are extensively used, but require the constant attention of the pilot (who is already overburdened with duties) if maximum allowable power is to be obtained at all altitudes. Throttle stops or gates severely limit the power at altitudes below the critical altitude, where full throttle operation is permissible. Automatic supercharger regulators or

boost controls give an ideal regulation of engine power output.

With all of the above arrangements, means are provided to override the

Fig. 1—Variation of specific fuel consumption with engine speed



P. & W. Mixture

by Guy E. Beardsley, Jr.*

power limitation, and sufficient fuel feed from the carburetor must be provided to prevent damage to the engine if the pilot accidentally or of necessity exceeds the limitation.

Let us consider the normal action of a carburetor as shown graphically in Fig. 1. As the throttle is opened, the mixture delivered by the carburetor should be rich enough to insure smooth, reliable engine operation. This necessitates a specific-consumption curve of the shape shown by the solid line. From the lowest r.p.m., where the main metering system is in operation, up to the low point on the curve, the carburetor delivers virtually a constant-ratio mixture, the downward slope of the curve being due to an increase in the mechanical efficiency of the engine. Above the lowest point (2180 r.p.m.) it is considered desirable for reliable engine operation to gradually increase the spe-

*Paper (slightly condensed) read at SAE regional meeting at Hartford, Conn. Mr. Beardsley is project engineer for the Pratt and Whitney Aircraft Company and has been actively associated with the development of the automatic power and mixture control for the past two and one-half years. The automatic power and mixture control has proved most satisfactory in service. It was used on the Hornet engines of the Pan American Sikorsky S-42 during its record flights from the United States to Hawaii and return and now becomes available as optional equipment on the latest models of Pratt & Whitney engines.

Develops Automatic Power and Control for Aircraft Engines

Mixture ratio held constant automatically up to certain critical altitude and power of supercharged engines limited at low altitudes

cific consumption. This is usually accomplished by a mechanically operated needle valve bringing an auxiliary jet into operation. For sea-level-rated engines the curve would stop at the line marked "Maximum Allowable Sea Level Power," but in the case of an altitude-rated engine it would continue on up as shown.

Owing to the inherent metering characteristics of a Venturi-type carburetor, the fuel-air ratio increases with decrease in density of the air entering the venturi. For this reason the whole curve moves upward as the airplane ascends. To properly correct for this, a device sensitive to changes in fuel-air ratio should be used, and such a device would also have to compensate for changes in air flow, as it is not necessary to have the enrichment shown from 2180 to full throttle above an altitude where the full throttle power does not exceed the value obtained at 2180 sea level. Devices for measuring the fuel-air ratio are available but are generally too cumbersome for practical use.

Needle valves in the carburetor, controlled by changes in the density of the air at the entrance to the venturis, would solve the problem theoretically, but practical application has shown that the system is not very accurate, owing to the great change in orifice coefficient with small changes in needle position.

Air at relatively low velocity, as used in conventional back-suction mixture controls, is easier to regulate accurately with a needle valve than gasoline flow, but a single automatically controlled back-suction valve produces a fuel curve as shown in Fig. 1 at all altitudes, and at full throttle at high altitudes gives a richer mixture than the power output warrants. This con-

dition is exaggerated in the case of an engine having a high-altitude rating, where provision has been made in the basic fuel curve for possible overriding of any of the above-mentioned methods of power limitation.

Since changes in carburetor metering with changes in altitude are caused by changes in the density of the air entering the venturis, if a constant

density were maintained at the venturis the carburetor would deliver a mixture corresponding to the solid-line curve in Fig. 1.

It was with a knowledge of these facts that the late Thorp Hiscock evolved the basic idea of combining power limitation and control of mixture ratio in a single unit. He proposed to maintain the density of the

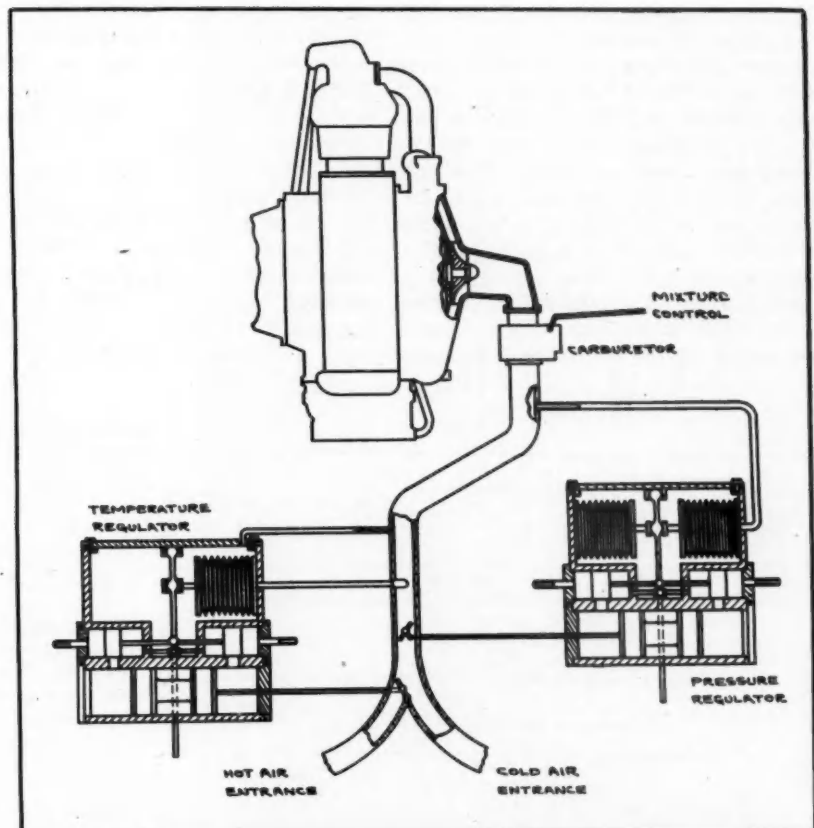


Fig. 2—Diagram of pressure and temperature-sensitive control devices designed to maintain a constant density at the carburetor inlet

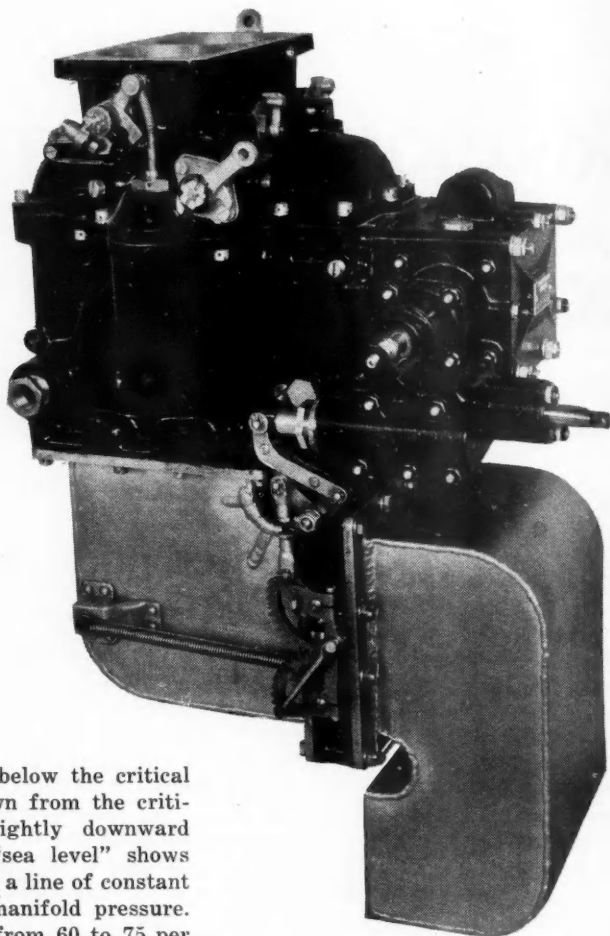
air entering the venturis at that corresponding to, say, 7000-ft. altitude. Thus the carburetor would be virtually held at 7000 ft. and would deliver a mixture of the same fuel-air ratio as it would normally deliver at 7000 ft., even though the plane might be at sea level. Fig. 2 shows diagrammatically how temperature and pressure regulators can be employed to maintain a constant air density.

Having thus assured constant density below 7000-ft. altitude, Mr. Hiscock further proposed to so position the mixture control that with a conventional carburetor the fuel consumption would be kept constant below this altitude. Inasmuch as throttling of an engine can be done at any point in the induction system, the standard carburetor throttle could be left open at all times and both the power and the mixture automatically controlled.

With the density of the air entering the carburetor at a constant value, and the carburetor throttling valves wide open, the density of the mixture entering the supercharger will remain virtually constant. This being true, as long as the impeller is turning at a constant speed, the manifold pressure will remain virtually constant. With this in mind let us turn to the effects of such regulation on engine power output.

Fig. 3 is a typical power curve showing the normal variation with altitude. The curves sloping downward from left to right are full-throttle, constant-speed points. Assuming this engine to have a rating of 800 hp. at 2400 r.p.m., it is seen that the critical altitude is 7000 ft. Below this altitude full throttle operation is not permitted. If, therefore, the absolute pressure at the entrance to the carburetor is regulated to never exceed the equivalent of this altitude, the power can never exceed the maximum allowable value. Owing to the effect of exhaust back pressure, the output of the engine will decrease

Fig. 4—Stromberg carburetor with Eclipse regulator



slightly at altitudes below the critical point. The line drawn from the critical-altitude point slightly downward and to the left to "sea level" shows this decrease, it being a line of constant speed and constant manifold pressure.

In most instances from 60 to 75 per cent of the engine rating is used for normal cruising. Considering 75 per cent or 600 b.h.p. a maximum, a similar limitation of power can be made by using a regulator set to maintain a pressure equivalent to the critical altitude for this condition. Considering 2180 r.p.m. a desirable engine speed for cruising, it is found by again referring to Fig. 3 that the critical altitude for this condition is 11,700 ft. Normally a pressure regulator is fixed to maintain only one pressure, but here it would be desirable to have a double range of pressures available.

At the time this work was started, some two and a half years ago, the most suitable type of pressure regulator available was the Eclipse Model M-2641 supercharger pressure regulator. During early development work it was found that deviations exceeding 1 in. of mercury occurred, depending on the position of the servo piston. The use of this regulator would have meant approximately 5 per cent variation in power and 3 per cent variation in fuel consumption, assuming everything else perfect. Being unwilling to accept such inherent variations, the development of a more suitable pressure regulator was started upon, and the additional feature of a double range was included.

Various means for positioning the carburetor mixture-control valve were tried, with both back-suction-type and needle-type controls. In neither case were the results consistent. In back-suction type of control, as the mixture is leaned out, the area provided for float-chamber venting usually decreases until in the full-lean position only the area of a No. 50 drill remains. With the absolute pressure in the float chamber reduced to the equivalent of 10,000 or 11,000 ft., some vaporization of the gasoline takes place in the float cham-

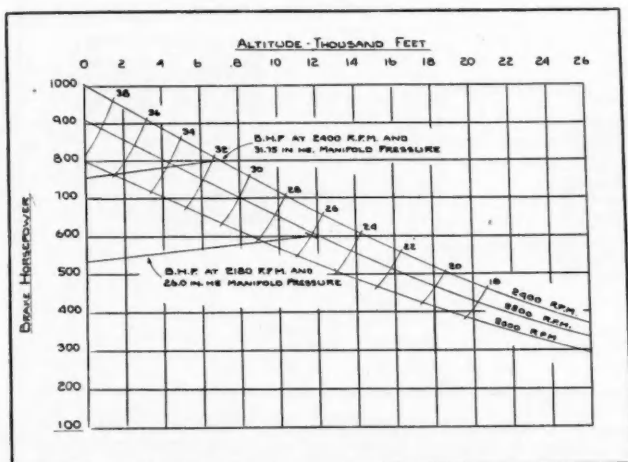


Fig. 3—Variation of engine power with altitude for three different engine speeds

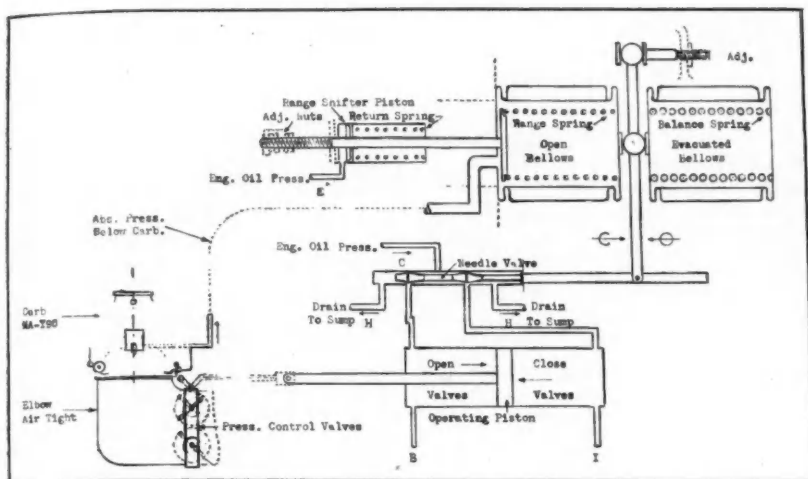


Fig. 5—Diagram illustrating operating principle of mixture-control regulator

ber, and unless adequate vent area is provided, the differential head between float chamber and discharge nozzle will be affected, thus changing the metering characteristics of the carburetor.

During all the attempts at positioning the mixture-control valve it was realized that the general shape of the fuel curve of Fig. 1 would be maintained. As pointed out above, the enrichment from 2180 r.p.m. on to full throttle is necessary only to obtain the increased power which it makes possible. If the full-throttle power does not exceed that obtained at 2180 r.p.m. at sea level, there is no need for the enrichment, and a curve like the lower dotted line would be more desirable. As is evident from Fig. 3, if the pressure in the carburetor is restricted to the equivalent of that at 11,700 ft., this power can never be exceeded. If, therefore, instead of the usual economizer action, a system of poppet valves controlling jets were to be used, the enrichment could be eliminated when the power limitation so warranted. Of course, sufficient jet capacity must still be provided when maximum allowable power is available. Thus, at maximum power the fuel curve would be similar to the upper dotted line in Fig. 1. With such an arrangement, excess fuel is provided if operating at part throttle with a 7000-ft. power limitation, but this can be avoided by shifting the setting of the device to 11,700 ft. and using full throttle.

With this brief history in mind let us see what the present production apparatus looks like. Fig. 4 shows the Stromberg Model NA-Y9C carburetor with an Eclipse Model 3105B regulator mounted on the rear. There is an elbow air scoop below the carburetor, with the air-valve assembly in place. The operating linkage between the regulator and the air valve assembly

is clearly visible. It is the intention to later make the air valves integral with the carburetor.

Fig. 5 shows the operation of the automatic mixture-control regulator diagrammatically. It will be seen that the principal operating parts are two bellows, a lever arm actuated by any movement of the bellows, and a needle valve directing oil to the two sides of the operating piston. Of the two bel-

lows, one is evacuated and spring loaded internally, and the other vented behind the venturis in the carburetor, hence is affected by the average carburetor-air-horn pressure. If the absolute pressure in the air horn is such that the evacuated bellows is collapsed, the lever arm is drawn to that side and, being fixed at the top, draws the needle valve to that side. This action admits engine oil pressure to the back side of the operating piston and at the same time opens the opposite end to drain, all of which forces the operating piston outward, and, through suitable linkages, closes off the pressure-control valves in the carburetor. As these valves are closing, the absolute pressure in the air horn is being reduced. When this pressure reaches such a value that the open bellows tends to collapse, thus expanding the evacuated bellows, the needle valve is thereby moved. During this movement there comes a time when the needle valve is in its central position, thus holding the operating piston and air valves stationary.

It will be seen that this set-up is a vicious circle and unless some method of damping is provided, mechanical hunting should be present. The necessary damping is provided by the taper on the needle valve. Tests were made

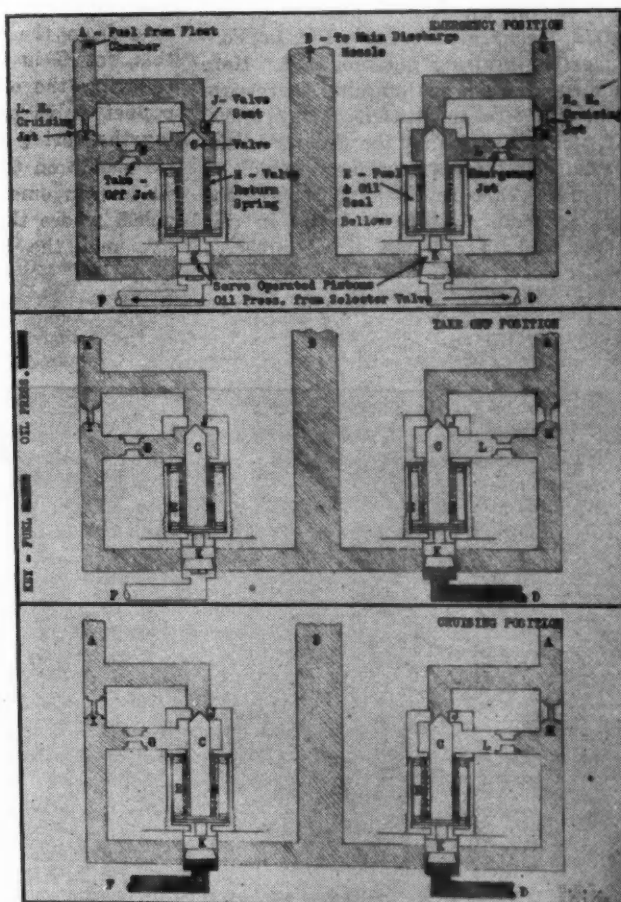


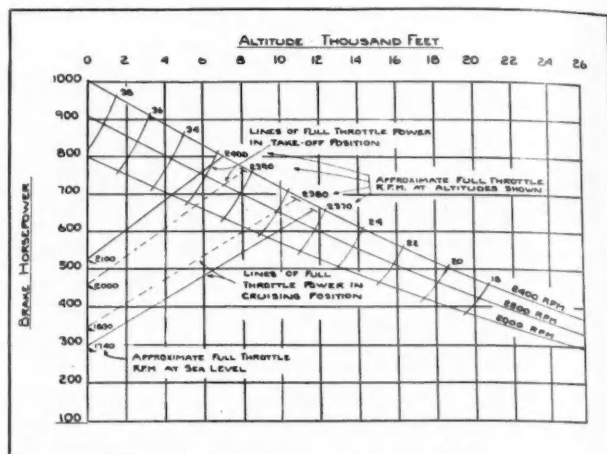
Fig. 6—Arrangement of jets and passages in carburetor

to determine the extent to which the regulator would overshoot the mark, and a taper was provided which slows down the action near the balance point to slightly reduce the "overshoot." The net result was to reduce the speed of action only when within a half inch of mercury of the balance pressure.

The absolute pressure to which the unit regulates depends on the strength of the springs in the two bellows. It is easily seen that an increase in spring compression in the open bellows will lower the balance pressure. This feature is used to enable the same regulator to control two different pressures, by means of what is termed the range-shifter piston, operating on the spring in the open bellows. Adjustable stop nuts are provided to limit the travel of the range-shifter piston in both directions, thus providing an adjustment for both regulated pressures.

Fig. 6 shows diagrammatically the jet and passage arrangement in the carburetor. The two outside passages are directly connected to the float chamber providing the fuel feed to the jets. The two cruising jets I and M are directly in these outside passages and the two auxiliary jets are located in a by-pass around jets I and M. The auxiliary jets G and L are cut in or out of action in accordance with the position of poppet valves C. After passing through the jets, the fuel goes across the lower passages to the center and up the central passage to the main discharge nozzles. Let us consider the cruising position first. Here the regulator is maintaining a pressure equivalent to an altitude of say 11,000 ft. This means that the density in the carburetor is greatly reduced, which on a normal carburetor would require the use of some mixture control. In this carburetor, jets I and M are selected

Fig. 8—Variation of brake horsepower with altitude when using two-position fixed propeller together with mixture control



to give the desired consumption at this altitude, the other two, G and L, being cut off, due to the poppet valve C being closed. As the regulator maintains a constant pressure in the carburetor, these two jets will give uniform metering at any altitude below that for which the device is set.

In the take-off or maximum-allowable-power position (sometimes used as a high-power-cruising position) the regulator is maintaining a pressure equivalent to a somewhat lower altitude, say 7000 ft. This necessitates additional jet capacity in the carburetor due both to the decrease in altitude and to higher power being available from the engine. To accomplish this, jet G is brought into action by relieving the oil pressure holding the poppet valve on its seat, thus allowing the spring to open this valve.

In addition to the two regulated positions, an emergency position is provided, where the regulator is inoperative and the atmosphere is free to

enter the venturis. Under this condition a further increase in jet capacity is obviously required. This is accomplished by bringing jet L into action by relieving the oil pressure holding the poppet valve controlling this jet on its seat. By the proper selection of the various jet sizes it is possible to obtain any desired fuel consumptions for the three possible operating conditions.

Fig. 7 shows the passages leading to and from the selector valve and the method by which the selector valve interconnects them. In the emergency position oil pressure is applied only to passage B, which is directly connected to the opening side of the operating piston. All other pressure passages are blocked off. Similarly, in this position all drainage passages are open, except the drain from the needle valve. By applying pressure to one side of the operating piston and opening the other side to drain, positive opening of the pressure control valves is assured. The two jet-operating pistons are both open to drain, and, being spring loaded, the needle valves are open and give maximum fuel capacity in the carburetor.

In the take-off position the two direct connections to the operating piston are closed off and the pressure and drain connections to the needle valve are opened, thus putting the regulator into operation. Passage E to the range-shifter piston is still open to drain, so the pressure maintained will be the higher absolute figure corresponding to the lower altitude. Only one of the jets has been cut off to compensate for the first altitude condition.

In the cruising position the only change from take-off is to shift the range spring so that regulation to a higher altitude is obtained and at the same time cut out the second needle-controlled jet, thus giving the proper carburetor metering to the regulated

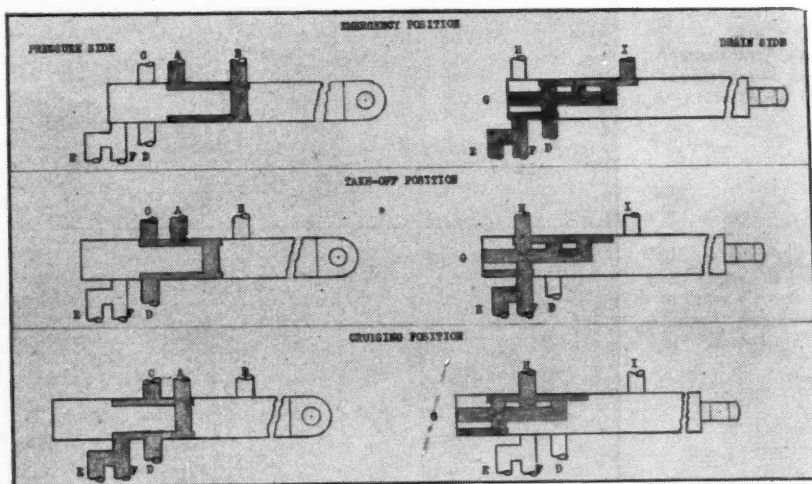


Fig. 7—Illustrating operation of selector valve

altitude. This is accomplished by connecting passages E and F to pressure instead of to drain.

We thus have a means of holding the power output in accordance with the values chosen in Fig. 3. At the same time there is a definite jet arrangement in the carburetor for each setting of the regulator, thus allowing an accurate means of mixture-strength determination.

During flight-test work, with a power- and mixture-control unit set to a critical altitude of 7200 ft., a test was made to determine at what altitude use of the manual mixture would be required. With the control delivering a lean best-power mixture when below the critical altitude, full rich operation was checked at several alti-

tudes, and not until 15,000 ft. was reached was it found possible to note even a tendency for the engine to increase in r.p.m. when leaning out. Theoretical calculations based on these figures indicate that with a critical altitude of 11,000 ft., best-power operation should be experienced without manual mixture adjustment to approximately 20,000-ft. altitude. In view of full-throttle power decreasing at a greater rate than the fuel-air ratio increases with altitude, the hourly consumptions when flying above the critical altitude of the control will decrease with increases in altitude.

Referring again to Fig. 3, we see the power control obtainable when this device is used on an engine having a constant-speed propeller. If, on the

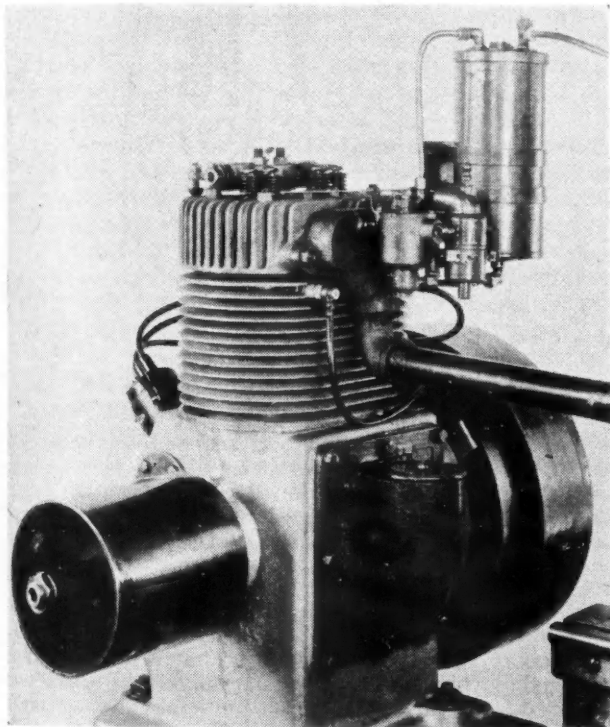
other hand, a two-position or fixed-pitch propeller were to be used, results similar to those shown in Fig. 8 might be expected. Here, because of the rapid change in engine r.p.m. with changes in altitude, a greater power variation is experienced. It would probably be desirable to provide two cruising positions as here shown by the dotted lines. Even though this would destroy the advantage of power control at take-off, it would provide a more useful arrangement for general operation.

In this device there is no provision for air-temperature regulation, because several operating companies expressed their preference for preheaters adjustable by the pilot, in view of the possibility of ice formation.

Air-Cooled Engine with Hard Aluminum Cylinder

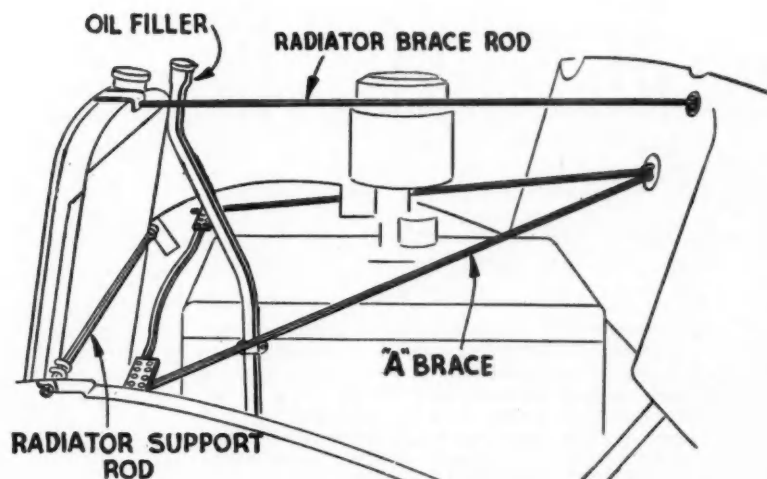
REFERRING to the item on K monel metal which appeared in our issue of March 23, Charles S. Brown of Syracuse, N. Y., writes that on Feb. 25 last he ran tests on what he believes to be the first hard-aluminum, air-cooled-cylinder engine ever built, in which a forerunner of this new nickel-aluminum development was used for the cylinder. While no exact measurements are made, Mr. Brown states there has been practically no wear on the piston during the time the engine has been run to date.

More recently an engine with large cylinder and large valve openings was built, and this has given some little heat trouble with the 6 to 1 compression ratio used; but Mr. Brown states he is convinced that the aluminum assisted materially in cooling the cylinders. With the small engine, which also had a compression ratio of 6 to 1, and which was cooled by a small fan only, there never was any backfiring, even when the engine was run continuously under full load.



Front-End Bracing in New Nash "400"

THE accompanying sketch shows how the front fenders are tied to the cowl by what is referred to as an "A" brace and how the radiator is supported by a cross bar bolted to the fenders and the usual radiator tie bar extending to the dash. Another feature shown is that the oil filler is carried up adjacent to the radiator filler, so that all of the usual service operations can be performed without lifting the hood, by opening a small service door controlled by the radiator ornament.



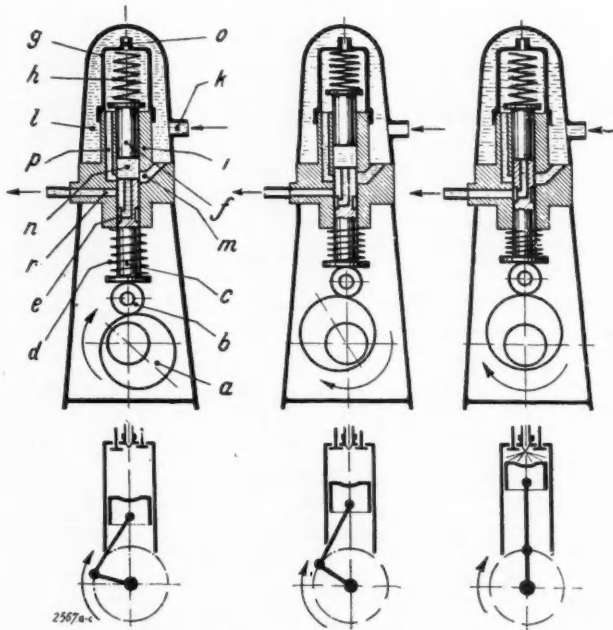
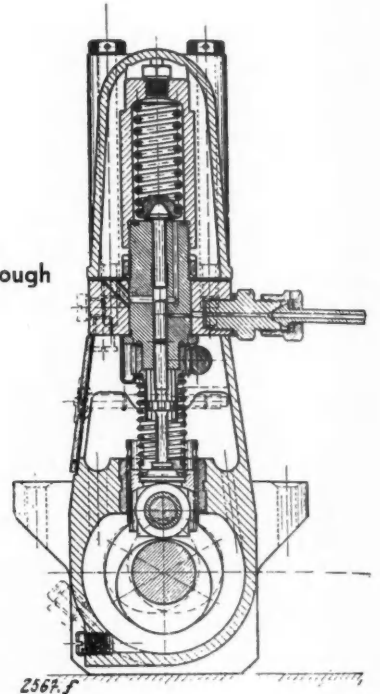
AUTOMOTIVE ABSTRACTS

New Scintilla Diesel Injection Pump of Ratellier Type

A NEW injection pump in which the elasticity of a steel spring and of a supply of accumulated fuel is made use of to inject the fuel has been marketed by the Swiss Scintilla firm and is known as the Ratellier system. As may be seen from the diagrammatic sketches, a plunger moved upward by an eccentric and returned by a spring during the suction stroke draws in a certain amount of fuel through inlet ports in the pump barrel controlled by the top edge of the plunger. When the inlet port is closed during the upstroke of the plunger, there is a certain amount of fuel between the plunger and an upper plunger, and further movement of the pump plunger results in compressing the coiled spring bearing down against the upper plunger, as well as the oil in the chamber surrounding the spring.

As the pump plunger approaches the upper end of its stroke a groove in its outer surface comes into registry with

Cross section through pump



Three phases in the cycle of operations of the Scintilla pump: Suction, compression, delivery

a, eccentric; b, roller follower; c, pump plunger; d, plunger return spring; e, delivery groove; f, upper plunger; g, spring dome or oil accumulator; h, coiled spring behind upper plunger; i, pump barrel; k, fuel connection to pump; l, suction chamber; m, inlet port; n, oil in pump barrel; o, pressure-relief orifice; p, port through which pump chamber communicates with fuel accumulator

the delivery port in the pump barrel, and the combined effect of the elastic force of the spring and of the oil under pressure in the spring "dome" forces the oil from the pump barrel, the groove in the plunger communicating with the interior of the pump barrel through an axial hole in the plunger. Injection ceases when the upper plunger ends up against the pump plunger.

It is well known that with injection systems in which the fuel is injected by spring force, the duration of injection is constant in time units, but extends over a much greater crank angle at high speeds. In fact, crankshaft speed and angular duration of injection are inversely proportional. This, of course, is undesirable, since it would result in some of the fuel being injected late in the power stroke at high engine speeds, which has a detrimental effect on the power and economy. To remedy this defect, the Scintilla pump is provided with a pressure-relief orifice *o* in the spring dome. When fuel is being compressed in the spring dome, some of it will escape through orifice *o*, and the proportional amount which escapes depends upon the speed of the engine. At high speed less fuel escapes through *o*, hence the fuel pressure in the dome becomes higher, which in turn increases the rate of fuel injection and reduces the angular duration of injection. By varying the size of the throttling orifice *o* and by so forming the pump plunger that at low speeds the delivery port area is opened rapidly, at low speeds more slowly, it is claimed, the characteristics of the pump can be to a great extent adapted to the particular requirements of the engine.

Quantity control is effected by means of the plunger, which has a helical upper edge, and can be rotated around its axis by means of a rack, by which means the effective inlet stroke can be varied as desired.

Timing of injection is effected by means of a sliding splined coupling, and quantity control is governed by a usual centrifugal governor.—ATZ, March 25.

JUST AMONG OURSELVES

Cars to Fit Every Taste

THE Auburn line includes 14 body types, but when all the combinations of color, glass, radio and equipment are figured, the company offers 4028 different models without getting into special items such as windshield wings, according to a recent newspaper release. Big as this total is, it is far from a record, as we are informed that on some lines the possible combinations run into six figures.

While offering all these variations doubtless increases sales, it also complicates both manufacturing and distribution. Final assembly tends to become, not mass production, but the building of specialized products. Obviously the problem is created by intensity of competition and for that reason no general solution appears possible or desirable. However, there must be a point of diminishing returns. The trick is to find it.

Unfortunately the law of natural selection does not operate to kill profitless variations in the automobile business as effectively as it does in nature.

* * *

Caravaners Hit by Legislation

AS is pretty generally known, caravaning new and used cars to far-western points has developed into quite a business. It is based on the fact that cars can be driven over the road, usually in tandem, for considerably less than the rail freight to the Pacific Coast, no allowance being made for wear and tear.

While opinion among the car makers is divided on the merits of this method of shipment, the practice has met with considerable opposition from dealers and from rail interests. As a result, a number of states have passed laws more or less directed at the caravaners, and this legislation promises to make their operations more difficult than in the past.

In Wyoming, a law has been passed setting up a new classification of carriers for operators of towing vehicles. Such operators must now get a permit, which may be withheld at the discretion of the administrative authority. Utah has a somewhat similar law. New Mexico also has a statute which can be used to hamper the caravaners. And there is a port of entry bill before the California Legislature which would make the caravaners subject to a mileage tax by classifying them as carriers.

* * *

A Show to Sell Industry's Importance

AUTOMOBILE shows have long been recognized as one of the industry's most effective means of dramatizing its products. Isn't it possible that they might also be used effectively to dramatize the industry's far-reaching economic importance?

True, this has been done in a small way from time to time, if we remember correctly, by mounting signs carrying various messages about the scope of the industry. But at this time, when the attitude of our national and state legislatures toward business seems on occasion to verge on hostility, it might

prove very worth while to impress the voting public in a big way with what a vigorous, healthy and expanding automotive industry means in the way of work, wages and national purchasing power.

In telling this story, it might be possible to enlist the cooperation of the steel, rubber, paint, glass, textile and perhaps other industries of this kind which are getting a large proportion of their sales from the motor industry. If these industries could be induced to provide exhibits that would combine educational features with what automotive purchases mean to them in employment, wages, etc., public interest in the shows should increase and public attitude toward industry should be influenced favorably.

* * *

A Pat Answer That Is Passé

ONE result of the recent Pennsylvania survey of dealer operations, as one factory executive sees it, is that the manufacturer can no longer tell the dealer who complains of the unprofitableness of his business, that his troubles are due entirely to his own shortcomings. The thin margin of black ink reported by the Pennsylvania dealers is evidence that the difficulty is general, although undoubtedly aggravated by inefficiency in individual instances.

* * *

AUTOMOBILE show promotion this year promises to be more than ordinarily intense. The car makers recognize that the fall show is a big experiment and they are determined to do their best to make it a successful one. If it doesn't work, therefore, it won't be because it didn't receive powerful backing.

The Editors

Tests Determine Ratio Axles and

NOW that overdrives are coming into more extensive use in passenger cars, the question of their mechanical efficiency is of general interest. Two forms of overdrive, the Columbia Axle Company's dual-ratio rear axle and the Borg-Warner Company's transmission-type overdrive as used on some models of the Chrysler Corp., have been tested at college laboratories, and a report on these tests was made by W. A. Gebhardt at a recent meeting of the S.A.E. Detroit Section. The tests on the Columbia dual-ratio axle were made at Yale University, while those on the Warner transmission-type overdrive were made

right-hand end of the axle. The left end of the housing was supported on a knife edge resting on a platform scale. A rigid arm was secured to the housing, extending at right angles from the center of the gimbal bearing. A steel ball pinned into the arm rested on a second platform scale.

An eight-cylinder engine with a maximum torque of 300 lb.-ft. and devel-

torque to a value which could be handled by the dynamometer. When a clockwise torque is put on the propeller shaft a downward force is exerted on the scale under the left end of the housing, and the product of the weight on the scale by the distance between knife edge and center of gimbal bearing is the input torque. The pinion tries to climb up on the ring gear and makes the housing tend to rotate around the axle shafts. This puts a load on the scale under the output arm, and this load multiplied by the length of the output arm is the output torque.

The axle ratio being known, the efficiency can be readily computed from the input and output torques. In actual service the hub bearings carry the weight of the car, while in the tests they were unloaded, hence the tests did not take account of losses in these bearings. Since the temperature of the lubricant affects the efficiency, means were provided to maintain the oil at 190 plus or minus 3 degrees F., this having been found to be approximately the mean temperature of the oil in regular service.

Fig. 2 shows results obtained with the gear in low ratio (low car speed) with input torques of 50 and 150 lb.-ft., when the axle housing contained a sulfurized E.P. lubricant of 1450 seconds viscosity. Each increase in the amount of oil in the axle decreased the efficiency throughout the speed range. This decrease in efficiency is more pronounced at the higher speeds, as might be expected, since increase in oil quantity increases churning losses appreciably at high speeds.

Fig. 3 shows results obtained with the high ratio (with the planetary overdrive in action), under the same conditions of torque and oil quantities. The efficiency curves are of substantially the same form as for the low ratio, but the falling-off tendency at high speeds is somewhat more pronounced for the high ratio. Since the churning loss is entirely independent of load and dependent on speed only, the proportional loss due to excess of oil in the housing at 50 lb.-ft. would be expected to be three times that at 150 lb.-ft., and the curves show this assumption to be correct, those for 50 lb.-ft. being

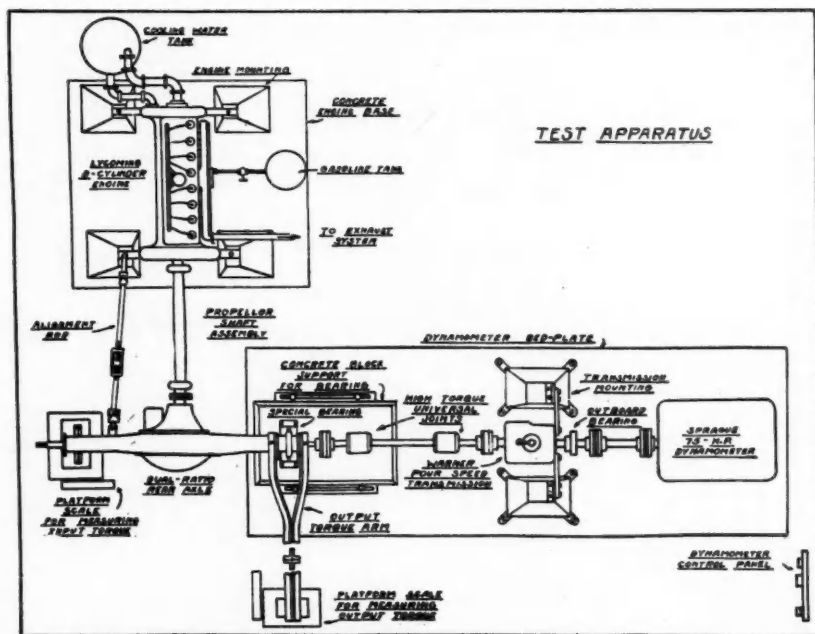


Fig. 1—Test set-up for tests on dual-speed axle

at Case School of Applied Science, with the faculty of which the author is connected. Both devices have been illustrated and fully described in these columns and may therefore be assumed to be familiar to the reader.

The test set-up in determining the efficiencies of the axle is of interest, as both the input and the output were determined by measuring the reaction on the axle housing. Referring to Fig. 1, the axle housing was supported at its right end by a sort of gimbal joint, allowing the axle two degrees of freedom, viz., around the axis of the axle shaft and in a vertical plane around the

opening 130 hp. at 2800 r.p.m. was used as the source of power and was connected to the axle by a standard propeller shaft. The differential gears on the axle were welded up, so that all of the power could be taken out through one side of the housing. In the tests the highest torque transmitted to the axle was the maximum crankshaft torque.

From the axle shaft the power was transmitted to an automobile transmission through a propeller shaft, the power being passed through this transmission in the reverse direction so as to increase the speed and reduce the

Efficiencies of Dual Transmission Overdrives

approximately three times as far apart as those for 150 lb.-ft.

The efficiency is the highest with five pints in the axle, but allowance must be made for loss by leakage, and the manufacturer therefore specifies six pints, which amount was used in all further tests.

Three different gear carriers were provided, with plain, roller and needle bearings for the planetary pinions respectively, and these are referred to as carriers Nos. 1, 2, and 3 respectively. All tests were run with six pints of E.P. lubricant.

Fig. 4 shows the results from carrier No. 1. Input torques of 50, 100, 150 and 200 lb.-ft. were used through an input speed range of 1000 to 2800 r.p.m. with both low and high ratio. It is seen that the efficiency increases with an increase in torque. This is explained by the fact that the churning losses are independent of load and therefore represent a lower percentage of high than of low torque. For instance, if the churning-loss torque at a certain speed were 1 lb.-ft. for 50 lb.-ft. input torque it would cause a 2 per cent loss, while for 200 lb.-ft. input

it would cause only $\frac{1}{2}$ per cent loss. Oil-churning losses would be expected to increase with the speed, and this is proven to be the case by the falling-off

tendency of all of the efficiency curves at the high-speed end.

Tests with lubricants of different viscosities showed that under light load the efficiency increases as the lubricant viscosity decreases. With the lightest oil the efficiency fell below that with the standard oil at low speeds, from which it is concluded that under these conditions the gear losses are so much increased when the light oil is used that the gain due to reduced churning losses is more than offset. At the higher speeds the efficiency was higher with the lighter oil. Tests on gear carrier No. 2, with roller bearings on the planetary pinions, naturally showed higher efficiencies for the high ratio than corresponding tests on gear carrier No. 1. The difference in efficiencies was of the order of 1 per cent throughout the speed range for an input torque of 50 lb.-ft. and correspondingly less for higher input torques.

Tests on the transmission-type overdrive unit served to determine some of the lubricant-temperature characteristics and the mechanical efficiency under given temperature conditions.

In these tests the torque-reaction method of measurement was again resorted to. The unit to be tested was

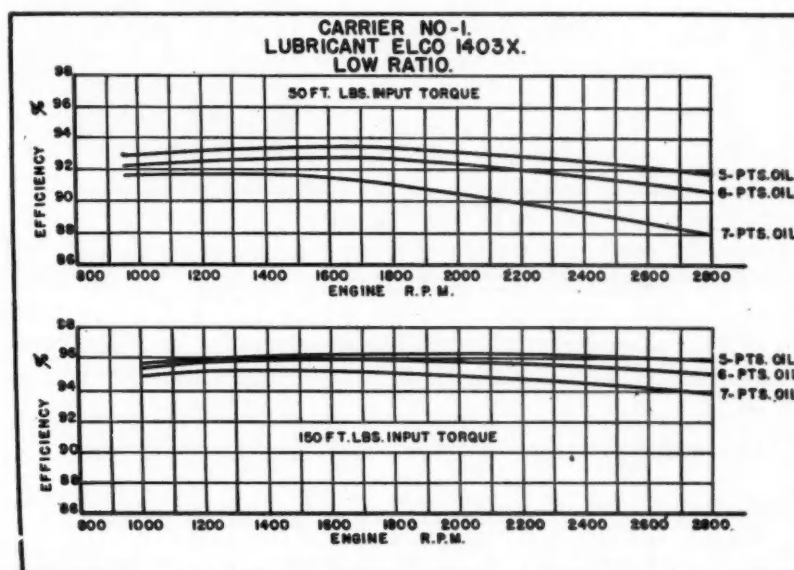


Fig. 2—Effect of quantity of lubricant in axle housing on mechanical efficiency
(Carrier No. 1, Elco 1403 X lubricant, low ratio)

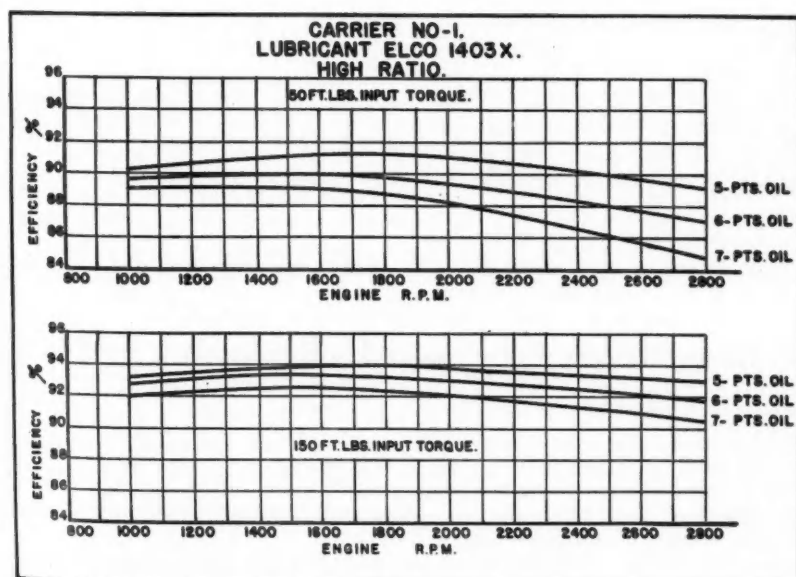
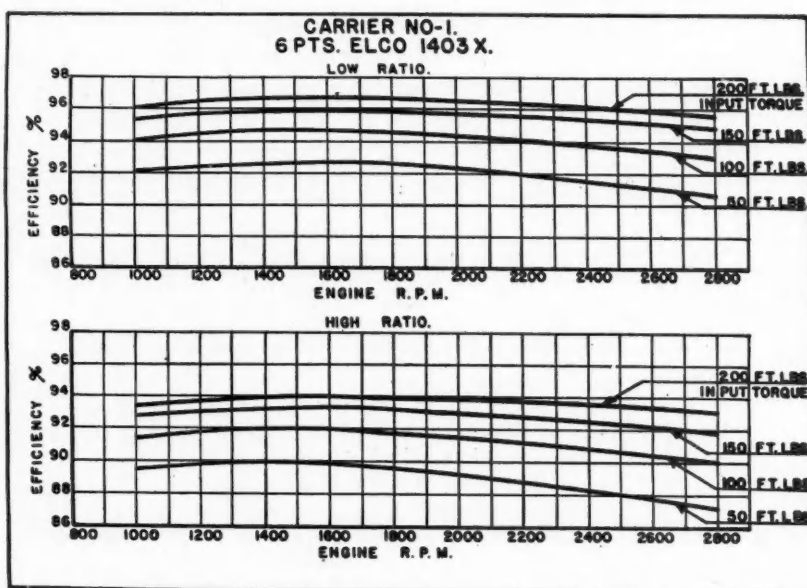


Fig. 3—Effect of quantity of lubricant in axle housing on efficiency
(Carrier No. 1, Elco 1403 X lubricant, high ratio)

mounted in ball-bearing trunnions, which allowed it to swing freely about the shaft axis. A torque arm was bolted rigidly to the gearcase and a steel ball mounted in the under side of the arm 18 in. from the shaft axis. A pedestal with a top plate of steel and resting on a platform scale supported the arm in a horizontal position. The scale could be read to 0.05 lb. throughout the load range.

A 150-hp. electric dynamometer served as source of power and was connected to the unit through a short propeller shaft. A 175-hp. electric dynamometer, similarly connected, served to



absorb the power output of the unit. In the test, the lubricant temperature was maintained at 130 plus or minus 5 degrees F. when in direct drive, and at 175 plus or minus 5 degrees F. when in overdrive. The unit was filled with Sinclair No. 80 F.W. Pennsylvania lubricant up to the recommended level. The torque-reaction method of tests is based

on the fact that the sum of the three torques on the unit is equal to zero, and this relationship was made use of for checking purposes. The three scales were periodically read, at an instant when they were in simultaneous balance. The torques were then computed and the sum of the output and gearbox torques were compared with the in-

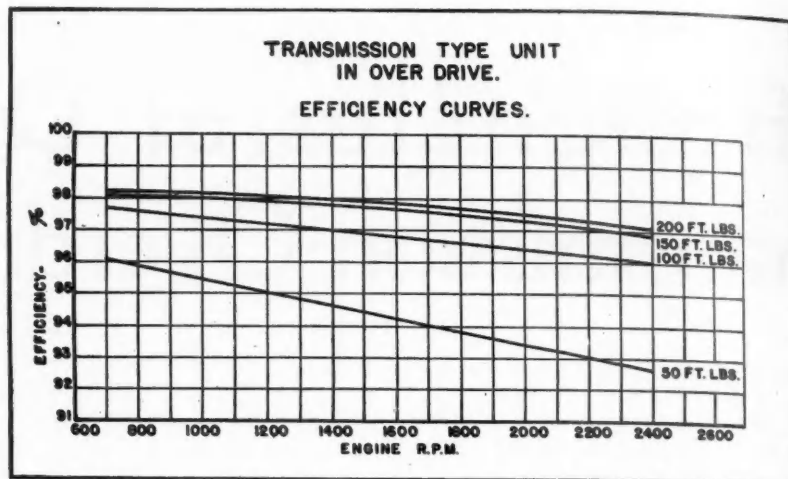


Fig. 5 (Above)—Efficiency of transmission-type overdrive unit in overdrive, for different torque inputs

Fig. 4 (Left)—Efficiencies of dual ratio axle in low and high ratios for different input torques

(Carrier No. 1, Elco 1403 X lubricant, 6 pints)

put, with which they were found to be in almost exact agreement.

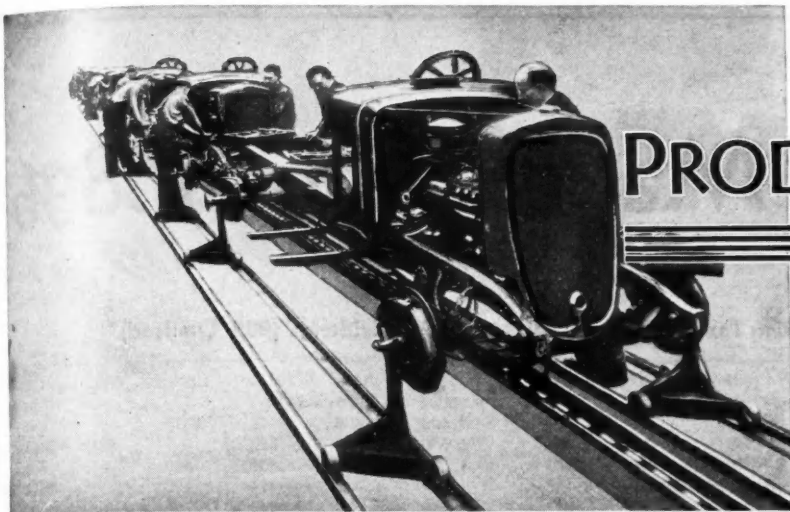
The efficiency characteristics of the unit for the four input torques are shown in Fig. 5. Under all loads the efficiency decreases with speed, which is undoubtedly due to the material increase in the churning losses with speed. It will be noted that the efficiency at maximum torque varies from 98.2 per cent at 700 r.p.m. to 97.2 per cent at 2400 r.p.m., whereas the efficiency for 50 lb.-ft. varies linearly from 96 per cent at 700 to 92.4 per cent at 2500 r.p.m.

Over 80% of German Heavy Trucks Are Powered with Diesels

OFFICIAL statistics regarding the use of Diesel engines in trucks, buses and tractors in Germany are available for the first time for the last half of 1934. Compared with 10,098 trucks and delivery wagons equipped with gasoline engines, there were registered 3827 equipped with Diesel and 78 equipped with other engines. However, more than half of the trucks with gasoline engines were vehicles of less than 1-ton capacity. In the heavier classes the Diesel is much more strongly represented. Thus 89 per cent of all trucks between 3 and 4 tons, 87.1 per cent of all

between 4 and 5 tons, and 92.3 per cent of all over 5 tons were Diesel-equipped. Of the motor buses registered during the six-months period, 180 were powered with gasoline and 250 with Diesel engines, while one had a power-plant of a different type.

Of the bolster-type tractors 58 carried gasoline engines, and 143 Diesel engines, while of the drawbar tractors 120 had gasoline engines, 744 hot-bulb engines, and 943 Diesel engines. Here too the proportion of Diesel-engined machines is greatest in the larger size classes.



PRODUCTION LINES

Rouge to Road

Just ran across a really handsome booklet giving more than a birdseye view of the gigantic Ford industries. It's entitled, "from the Rouge to the Road," Replete with striking illustrations and thumbnail sketches of important activities, it is both interesting and educational. You can have it for the asking.

Better Control

What with the unquestioned interest in air conditioning of various production departments, plant engineers will find it of value to look over a bulletin recently issued by Leeds & Northrup. It's entitled, "Efficient Regulation of An Air-Conditioning System" and shows in a technical way how the L&N electrical resistance thermometer helps to do the job. If interested write us.

Black and Silver

That isn't intended as a play on words, on the fact that Black & Decker has brought out a silver anniversary book on their line of portable tools. Here is a complete description of every portable tool in this company's broad line. And it's handsomely done in tones of silver and black so as to look well on your desk.

Airlined Tractor

Something new in farm tractors is expected on the horizon in about 90 days. First, it will introduce styling patterned after the cars that the farmer sees and owns today. But its biggest feature will be fuel economy through a combination of a

very high compression head for a gasoline engine of this type; a variable speed governor control; and a multi-speed transmission. Isn't that big news for the industry and users?

Cute Gadget

One of the smartest instrument board attachments we have seen in a long time will be found on a new car that's coming out in a couple of weeks. There is a gage on the board normally used to register the amount of fuel in the gas tank. Control is electric. The same gage will show the amount of crankcase oil upon pressing a little button which connects the circuit to a float in the crankcase. Very smart, very practical.

More Scientific

Not so long ago we commented on the practice of coining words to give the true publicity touch to certain new engineering features. We suggested, at the time, recourse to familiar engineering terms culled from thermodynamics and physics, and elsewhere. Imagine our delight at learning that a certain new car is to have "Iso-Thermal Fuel Control."

Improvement

Wally Miller tells us that he has completed a number of refinements in the springing of the car we described in *Automotive Industries*, May 4. Front spring rate has been upped to 80 while the rear has been lowered to 80 making it even all around. In addition, a special set of shock absorbers has been built to suit this spring rate, producing what

Wally chooses to call a real floating ride. Incidentally, one of the bigger car builders is interested.

Heated Lobes

Hudson's iron alloy camshafts, when we first got acquainted with them, had the cam lobe hardened by chilling in the mold. That was changed for the better some time ago. Now the shaft is cast normally without chilling anywhere. The cams are hardened within definitely controlled limits by heating with a gas flame. This is done in an ingenious fixture having jets disposed at precisely the location of the individual cam.

Checks Plating

What with constant demand for better quality of electroplating for automotive consumption, Grasselli has just done a good turn for the men concerned with this responsibility. Hot off the press is a *Cadalyte Service Bulletin* on the Hull and Strausser test for determining precisely the thickness of cadmium and zinc electrodeposits. It describes the method and equipment completely. Without disclosing the whole thing here, the method consists in "dropping" acidified ammonium nitrate solutions on the plated work. Time required to expose the steel determines thickness of coatings. Now we're getting somewhere. We can get you a copy.

Streamlines

Surprising how many people have talked to us about the streamlined job that Briggs showed a year ago in connection with the Ford Expositions. Everybody seems to like the appearance of that job, and for that matter so do we—J. G.



27 Parts Makers Earn 7.8%

Net Income After Deducting Taxes (000 Omitted)

	1929	1930	1931	1932	1933	1934
American Chain.....	\$3,279	\$1,685	<i>d\$2,183</i>	<i>d\$2,986</i>	<i>d\$432</i>	\$492
Bendix Aviation.....	7,417	1,251	1,555	<i>d1,601</i>	1,243	1,903
Bohn Aluminum.....	2,620	726	295	<i>d721</i>	1,495	1,518
Borg-Warner.....	6,685	2,318	1,208	<i>d598</i>	1,196	3,751
Briggs Manufacturing Co.....	2,427	4,036	684	<i>d1,896</i>	1,591	5,122
Campbell, Wyant & Cannon..	1,279	638	191	<i>d318</i>	40	<i>d17</i>
Eaton Manufacturing Co.....	1,502	1,205	243	<i>d674</i>	360	978
Electric Autolite.....	14,514	5,043	3,914	1,364	684	1,212
Electric Storage Battery.....	7,911	5,647	2,770	1,260	2,022	2,004
Hayes Body.....	<i>d245</i>	<i>d853</i>	<i>d880</i>	<i>d294</i>	<i>d288</i>	<i>d122</i>
Houdaille Hershey.....	1,519	<i>d157</i>	102	<i>d590</i>	<i>d112</i>	931
Lycoming.....	713	<i>d586</i>	1,240	<i>d456</i>	<i>d593</i>	<i>d443</i>
Marlin Rockwell.....	2,707	922	<i>d23</i>	<i>d123</i>	111	538
Midland Steel Products.....	2,555	1,272	776	<i>d221</i>	673	681
Motor Products.....	2,141	487	<i>d18</i>	<i>d518</i>	<i>d217</i>	135
Motor Wheel.....	3,480	987	<i>d572</i>	<i>d1,187</i>	122	410
McCord Radiator.....	618	11	<i>d284</i>	<i>d649</i>	25	<i>d28</i>
Mullins Manufacturing.....	477	11	100	<i>d696</i>	<i>d268</i>	187
Murray Corporation.....	1,308	234	<i>d1,241</i>	<i>d1,881</i>	<i>d777</i>	<i>d798</i>
Raybestos-Manhattan.....	3,206	1,157	554	<i>d457</i>	685	751
Spicer Manufacturing Co.....	2,120	40	<i>d1,016</i>	<i>d1,414</i>	<i>d131</i>	670
Stewart-Warner.....	6,839	1,262	<i>d1,830</i>	<i>d2,445</i>	<i>d1,791</i>	572
Thompson Products.....	1,231	106	<i>d107</i>	<i>d182</i>	174	381
Timken Detroit Axle.....	1,513	842	328	<i>d1,194</i>	<i>d1,257</i>	426
Timken Roller Bearing.....	14,155	7,524	2,571	<i>d483</i>	2,173	3,486
Trico Products.....	2,250	1,908	1,763	965	1,418	1,772
L. A. Young.....	2,213	1,295	522	<i>d196</i>	418	811
Totals.....	\$96,434	\$39,011	\$10,662	<i>d\$18,186</i>	\$8,544	\$27,323

Dividends (000 Omitted)

	1929	1930	1931	1932	1933	1934
American Chain.....	\$935	\$1,471	\$1,008			
Bendix Aviation.....	3,126	3,608	2,097	\$315		
Bohn Aluminum.....	1,580	793	529		\$352	\$1,057
Borg-Warner.....	4,365	3,609	1,461	530	518	1,663
Briggs Manufacturing Co.....		1,002	2,994	490		3,391
Campbell, Wyant & Cannon..	663	738	343			
Eaton Manufacturing Co.....	894	1,479	743	82	131	857
Electric Autolite.....	5,694	5,872	4,767	1,987	293	298
Electric Storage Battery.....	4,542	4,579	4,013	2,198	1,815	2,042
Hayes Body.....						
Houdaille Hershey.....	1,080	856	436	108		435
Lycoming.....	81	70	81	75	71	68
Marlin Rockwell.....	2,182	2,003	728	308	236	753
Midland Steel Products.....	1,637	1,660	1,597	759	664	664
Motor Products.....	2,079	392	388	286		
Motor Wheel.....	1,985	2,484	839			
McCord Radiator.....	332	295	61			
Mullins Manufacturing.....	210	206	151			
Murray Corporation.....	827	17	17	16	16	16
Raybestos-Manhattan.....	1,538	1,728	1,389	453	386	642
Spicer Manufacturing Co.....	300	300	280	264	216	257
Stewart-Warner.....	4,178	2,750				
Thompson Products.....	606	654	336	85		51
Timken Detroit Axle.....	1,017	996	388	194	194	193
Timken Roller Bearing.....	7,223	7,236	6,029	3,316	1,688	2,773
Trico Products.....	834	937	937	937	937	937
L. A. Young.....	1,102	1,167	874	388		486
Totals.....	\$49,010	\$46,902	\$32,486	\$12,791	\$7,517	\$16,583

Plant and Property (000 Omitted)

	1929	1930	1931	1932	1933	1934
American Chain.....	\$13,136	\$13,453	\$12,614	\$11,758	\$10,871	\$10,104
Bendix Aviation.....	7,985	11,945	11,486	10,196	9,634	9,066
Bohn Aluminum.....	5,115	5,162	5,029	2,693	2,564	2,459
Borg-Warner.....	17,545	18,394	17,665	15,750	14,248	13,290
Briggs Manufacturing Co.....	20,446	21,417	19,901	11,039	9,840	10,170
Campbell, Wyant & Cannon..	3,875	3,875	3,573	3,363	3,190	3,210
Eaton Manufacturing Co.....	7,943	10,908	7,720	7,476	6,832	7,201
Electric Autolite.....	11,280	12,555	11,304	8,238	7,625	8,991
Electric Storage Battery.....	13,018	12,455	11,497	10,715	9,965	9,513
Hayes Body.....	3,661	3,361	3,137	2,263	2,060	1,609
Houdaille Hershey.....	4,635	4,846	7,344	7,104	6,404	6,040
Lycoming.....	2,865	3,289	3,488	3,335	2,976	2,649
Marlin Rockwell.....	2,599	2,463	2,099	1,856	1,627	1,469
Midland Steel Products.....	6,014	5,734	5,377	4,933	4,729	4,804
Motor Products.....	4,364	4,153	3,918	3,647	3,584	3,626
Motor Wheel.....	7,230	7,052	6,693	6,273	5,588	5,631
McCord Radiator.....	4,140	3,526	3,175	2,732	2,339	2,363
Mullins Manufacturing.....	4,434	4,578	4,980	3,235	1,745	1,717
Murray Corporation.....	20,790	20,122	19,869	10,099	9,640	9,423
Raybestos-Manhattan.....	7,543	7,401	7,014	6,769	6,453	6,406
Spicer Manufacturing Co.....	8,807	7,885	6,785	4,652	4,061	3,953
Stewart-Warner.....	17,211	16,759	12,411	11,794	8,992	7,530
Thompson Products.....	3,298	3,445	3,498	3,459	1,958	1,980
Timken Detroit Axle.....	7,730	7,761	7,491	6,819	6,078	5,517
Timken Roller Bearing.....	23,207	22,647	20,715	18,769	17,288	15,928
Trico Products.....	1,601	1,586	1,655	1,606	1,497	1,445
L. A. Young.....	4,028	3,909	3,715	3,355	3,517	3,866
Totals.....	\$234,500	\$240,682	\$224,153	\$183,928	\$165,305	\$161,960

Good Will, Patents, Etc. (000 Omitted)

	1929	1930	1931	1932	1933	1934
American Chain.....	\$2,649	\$2,429	\$1,899	\$832	\$635	\$585
Bendix Aviation.....	33,281	36,672	36,801			
Bohn Aluminum.....	181	150	134	124	104	87
Borg-Warner.....	679	546	465	421	405	380
Briggs Manufacturing Co.....						
Campbell, Wyant & Cannon..						
Eaton Manufacturing Co.....	337	298	282	271	223	216
Electric Autolite.....						
Electric Storage Battery.....						
Hayes Body.....						
Houdaille Hershey.....						
Lycoming.....						
Marlin Rockwell.....						
Midland Steel Products.....	1,675	1,675	1,675	1,916	1,920	1,895
Motor Products.....						
Motor Wheel.....						
McCord Radiator.....						
Mullins Manufacturing.....	86	89	94	14	22	27
Murray Corporation.....	301	301	296			
Raybestos-Manhattan.....	595	595	595	595	595	595
Spicer Manufacturing Co.....	209	188	174			
Stewart-Warner.....						
Thompson Products.....	834	833	830	827	824	831
Timken Detroit Axle.....			1,684	1,684	1,624	1,564
Timken Roller Bearing.....						
Trico Products.....	351	350	337	336	330	309
L. A. Young.....	479	275	275	275	1,110	900
Totals.....	\$41,657	\$44,401	\$45,541	\$7,295	\$8,387	\$7,984

on Net Worth in 1934

(Continued on
next page)

Cash and Securities (000 Omitted)

	1929	1930	1931	1932	1933	1934
American Chain.....	\$969	\$1,582	\$996	\$1,403	\$1,248	\$2,003
Bendix Aviation.....	8,132	4,761	3,941	3,537	4,996	7,233
Bohn Aluminum.....	2,948	1,178	460	483	79	117
Borg-Warner.....	8,401	7,199	7,175	7,493	7,637	7,842
Briggs Manufacturing Co.....	2,324	12,859	7,540	6,691	6,913	8,642
Campbell, Wyant & Cannon..	569	831	790	770	618	590
Eaton Manufacturing Co.....	1,212	2,261	2,562	2,030	2,375	2,462
Electric Autolite.....	10,527	2,615	1,994	918	1,269	2,394
Electric Storage Battery.....	9,734	13,224	14,983	16,190	16,362	16,377
Hayes Body.....	223	137	16	11	12	46
Houdaille Hershey.....	1,997	1,586	1,927	2,038	1,793	2,293
Lycoming.....	216	144	79	134	64	80
Marlin Rockwell.....	5,832	4,879	3,834	3,521	3,100	2,682
Midland Steel Products.....	7,363	6,837	6,096	4,907	4,600	4,199
Motor Products.....	3,048	3,276	2,950	2,060	1,399	2,054
Motor Wheel.....	3,960	2,547	1,996	1,537	298	645
McCord Radiator.....	316	360	156	104	116	156
Mullins Manufacturing.....	441	139	427	84	149	64
Murray Corporation.....	1,617	3,285	3,358	2,965	706	319
Raybestos-Manhattan.....	3,472	3,306	3,164	3,325	2,641	2,666
Spicer Manufacturing Co.....	704	974	693	1,122	731	866
Stewart-Warner.....	3,039	4,537	4,649	2,851	1,274	1,043
Thompson Products.....	740	349	155	162	212	174
Timken Detroit Axle.....	3,680	3,401	3,487	3,050	2,700	2,065
Timken Roller Bearing.....	13,615	14,547	14,037	13,556	14,210	16,455
Trico Products.....	1,620	2,940	3,459	3,700	4,421	5,314
L. A. Young.....	2,182	1,545	1,378	939	394	1,130
Totals.....	\$98,881	\$101,299	\$92,302	\$85,581	\$80,317	\$90,911

Receivables (000 Omitted)

	1929	1930	1931	1932	1933	1934
American Chain.....	\$5,862	\$4,381	\$2,759	\$1,902	\$2,472	\$2,373
Bendix Aviation.....	2,331	2,269	1,870	1,344	1,525	2,254
Bohn Aluminum.....	1,242	913	683	475	909	1,043
Borg-Warner.....	3,188	2,270	2,337	1,269	1,729	4,042
Briggs Manufacturing Co.....	5,893	1,339	760	1,294	3,741	5,244
Campbell, Wyant & Cannon..	484	353	196	143	278	378
Eaton Manufacturing Co.....	1,034	1,118	840	689	626	1,561
Electric Autolite.....	3,983	3,037	2,165	1,742	1,915	3,057
Electric Storage Battery.....	7,217	5,841	4,331	3,297	3,158	3,319
Hayes Body.....	605	762	390	142	84	116
Houdaille Hershey.....	687	405	368	237	645	1,161
Lycoming.....	666	497	297	219	136	172
Marlin Rockwell.....	432	210	180	140	212	703
Midland Steel Products.....	1,010	682	495	770	863	1,419
Motor Products.....	517	391	328	329	440	759
Motor Wheel.....	994	823	534	586	663	848
McCord Radiator.....	1,067	680	430	341	451	474
Mullins Manufacturing.....	470	701	811	214	223	401
Murray Corporation.....	2,828	758	634	731	1,941	1,480
Raybestos-Manhattan.....	1,732	1,496	1,254	1,019	1,434	1,580
Spicer Manufacturing Co.....	1,217	952	711	293	613	695
Stewart-Warner.....	4,082	2,373	1,733	1,168	1,298	1,824
Thompson Products.....	698	459	518	356	425	621
Timken Detroit Axle.....	1,763	1,653	1,922	1,255	1,083	1,785
Timken Roller Bearing.....	1,963	1,376	1,087	551	1,545	2,047
Trico Products.....	691	516	519	389	414	594
L. A. Young.....	1,074	576	590	472	700	1,019
Totals.....	\$53,730	\$36,831	\$28,742	\$21,367	\$29,523	\$40,969

Inventories (000 Omitted)

	1929	1930	1931	1932	1933	1934
American Chain.....	\$7,596	\$7,778	\$6,418	\$4,646	\$4,401	\$4,669
Bendix Aviation.....	5,239	4,754	3,993	3,066	4,020	4,110
Bohn Aluminum.....	2,212	3,467	3,785	2,977	4,592	4,304
Borg-Warner.....	7,632	5,725	5,046	3,877	5,625	8,283
Briggs Manufacturing Co.....	a9,867	a4,660	a5,232	a5,539	a6,352	a8,891
Campbell, Wyant & Cannon..	817	299	296	209	454	538
Eaton Manufacturing Co.....	2,298	2,650	2,451	1,797	1,961	2,306
Electric Autolite.....	4,366	3,144	2,510	1,954	2,223	3,480
Electric Storage Battery.....	7,576	6,589	4,692	3,492	4,031	4,220
Hayes Body.....	1,951	567	232	179	113	179
Houdaille Hershey.....	1,756	798	726	723	913	1,380
Lycoming.....	2,118	1,582	1,541	1,566	1,406	1,116
Marlin Rockwell.....	1,646	1,123	730	602	896	1,053
Midland Steel Products.....	1,132	867	809	643	1,357	1,072
Motor Products.....	1,210	851	659	524	1,202	881
Motor Wheel.....	2,821	1,884	1,489	1,144	2,214	1,695
McCord Radiator.....	1,208	768	715	414	626	687
Mullins Manufacturing.....	1,750	1,136	1,269	861	460	504
Murray Corporation.....	4,630	4,159	3,296	2,186	2,653	2,862
Raybestos-Manhattan.....	4,759	3,511	2,326	1,933	3,309	3,477
Spicer Manufacturing Co.....	4,328	2,575	1,627	610	1,089	1,456
Stewart-Warner.....	7,771	4,453	2,869	2,194	2,581	3,176
Thompson Products.....	1,995	1,096	765	809	876	1,034
Timken Detroit Axle.....	4,788	3,393	3,248	2,634	2,413	3,019
Timken Roller Bearing.....	10,676	8,708	6,292	4,927	7,074	7,629
Trico Products.....	668	708	606	451	435	489
L. A. Young.....	1,204	1,023	804	771	1,552	1,042
Totals.....	\$104,014	\$78,268	\$64,426	\$50,728	\$64,828	\$73,552

Current Assets (000 Omitted)

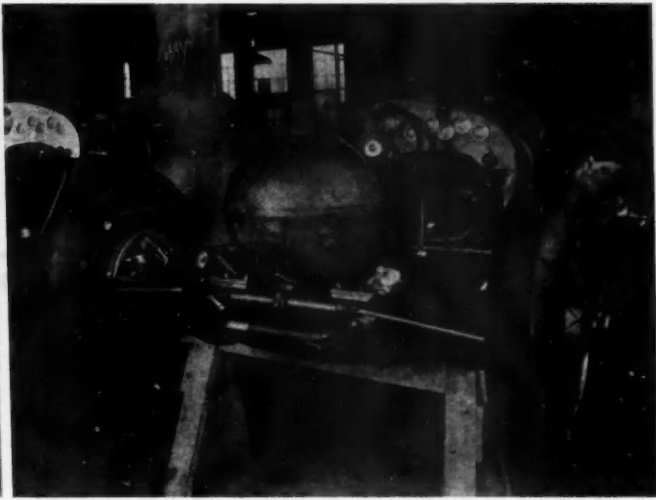
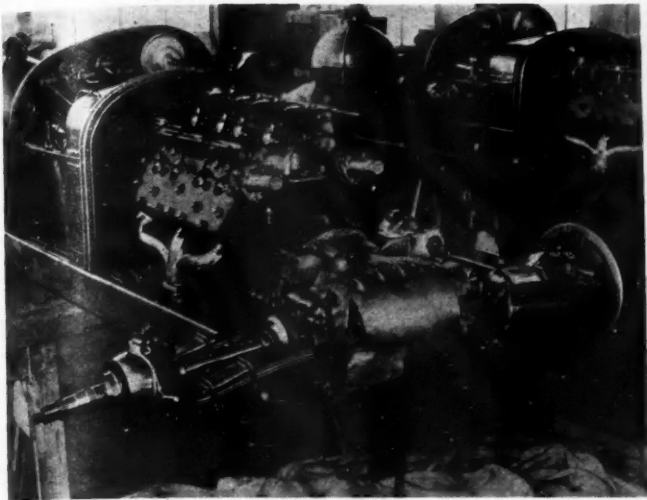
	1929	1930	1931	1932	1933	1934
American Chain.....	\$14,427	\$13,740	\$10,173	\$7,950	\$8,121	\$9,045
Bendix Aviation.....	25,573	12,883	9,803	7,947	10,541	13,597
Bohn Aluminum.....	6,450	5,610	4,987	4,298	5,648	5,537
Borg-Warner.....	19,222	15,194	14,645	12,674	14,992	20,168
Briggs Manufacturing Co.....	18,084	18,858	13,532	13,525	17,007	22,778
Campbell, Wyant & Cannon..	1,870	1,483	1,281	1,122	1,351	1,506
Eaton Manufacturing Co.....	4,544	6,029	6,180	4,516	4,962	6,330
Electric Autolite.....	18,876	8,797	6,669	4,614	5,407	8,931
Electric Storage Battery.....	24,567	25,696	24,068	23,111	23,691	24,044
Hayes Body.....	2,818	1,510	642	341	210	342
Houdaille Hershey.....	4,441	2,789	3,048	3,033	3,351	4,834
Lycoming.....	3,033	2,336	1,918	1,920	1,606	2,051
Marlin Rockwell.....	7,910	6,212	4,744	4,263	4,208	4,438
Midland Steel Products.....	9,505	8,386	7,401	6,321	6,820	6,690
Motor Products.....	4,775	4,518	3,938	2,913	3,041	3,695
Motor Wheel.....	7,775	5,255	4,019	3,266	3,175	3,188
McCord Radiator.....	2,592	1,808	1,301	860	1,194	1,318
Mullins Manufacturing.....	2,661	1,975	2,507	1,159	831	969
Murray Corporation.....	9,074	8,201	7,288	5,888	5,301	4,661
Raybestos-Manhattan.....	9,963	8,312	6,745	6,278	7,385	7,728
Spicer Manufacturing Co.....	6,249	4,501	3,031	2,025	2,433	3,018
Stewart-Warner.....	14,892	11,363	9,251	6,213	5,155	6,043
Thompson Products.....	3,433	1,904	1,437	1,327	1,513	1,829
Timken Detroit Axle.....	10,231	5,055	8,658	6,940	6,195	6,869
Timken Roller Bearing.....	26,254	24,631	21,487	19,056	22,829	26,131
Trico Products.....	3,054	4,308	4,944	4,896	5,649	6,998
L. A. Young.....	4,550	3,232	2,786	2,196	2,650	3,193
Totals.....	\$266,823	\$214,586	\$186,483	\$158,647	\$175,266	\$205,926

27 Parts Makers Earn 7.8% on Net Worth in 1934

(Continued from the preceding page)

	Current Liabilities (000 Omitted)						Working Capital (000 Omitted)					
	1929	1930	1931	1932	1933	1934	1929	1930	1931	1932	1933	1934
American Chain.....	\$1,826	\$1,278	\$778	\$610	\$648	\$697	\$12,601	\$12,463	\$9,395	\$7,340	\$7,472	\$8,348
Bendix Aviation.....	3,542	2,569	2,142	1,340	1,501	1,859	22,031	10,314	7,661	6,607	9,040	11,738
Bohn Aluminum.....	1,375	581	325	223	702	798	5,076	5,029	4,662	4,076	4,946	4,739
Borg-Warner.....	4,392	2,629	2,781	1,118	1,816	4,688	14,830	12,565	11,864	11,556	13,176	15,480
Briggs Manufacturing Co.....	5,454	3,526	2,503	1,909	2,683	7,234	12,630	15,332	11,029	11,615	14,324	15,545
Campbell, Wyant & Cannon..	502	208	207	136	167	247	1,369	1,275	1,075	986	1,184	1,259
Eaton Manufacturing Co.....	1,304	1,177	900	605	680	1,490	3,240	4,852	5,279	3,911	4,283	4,841
Electric Autolite.....	4,784	2,562	1,488	1,018	843	2,410	14,092	6,235	5,180	3,596	4,564	6,521
Electric Storage Battery.....	2,633	1,999	1,110	822	972	1,362	21,933	23,698	22,958	22,289	22,718	22,683
Hayes Body.....	1,072	295	179	277	198	275	1,746	1,215	462	64	12	67
Houdaille Hershey.....	1,001	264	413	388	569	959	3,439	2,525	2,635	2,610	2,781	3,875
Lycoming.....	1,084	1,808	350	90	188	127	1,948	528	1,568	1,830	1,419	1,924
Marlin Rockwell.....	1,800	1,380	242	118	111	173	6,109	4,832	4,502	4,145	4,098	4,265
Midland Steel Products.....	1,431	900	612	239	845	826	8,074	7,486	6,789	6,082	5,975	5,864
Motor Products.....	1,043	384	323	285	980	679	3,733	4,134	3,615	2,628	2,061	3,016
Motor Wheel.....	1,091	651	1,036	1,438	1,366	758	6,684	4,604	2,983	1,828	1,810	2,431
McCord Radiator.....	560	168	277	258	384	655	2,032	1,640	1,025	602	810	663
Mullins Manufacturing.....	225	249	1,271	581	466	363	2,436	1,726	1,236	577	365	606
Murray Corporation.....	2,271	1,148	873	581	1,225	1,680	6,803	7,054	6,415	5,301	4,075	2,982
Raybestos-Manhattan.....	1,143	533	349	313	609	771	8,819	7,779	6,396	5,965	6,776	6,951
Spicer Manufacturing Co.....	2,504	715	696	418	626	778	3,746	3,786	2,335	1,608	1,807	2,240
Stewart-Warner.....	2,773	1,471	948	783	1,404	1,155	12,119	9,892	8,303	5,430	3,751	4,888
Thompson Products.....	1,483	517	496	522	541	542	1,951	1,387	941	805	972	1,286
Timken Detroit Axle.....	1,538	510	1,095	279	501	860	8,693	4,545	7,563	6,661	5,695	6,009
Timken Roller Bearing.....	3,694	2,295	1,144	512	1,572	1,674	22,560	22,335	20,343	18,544	21,257	24,557
Trico Products.....	846	806	759	615	779	1,079	2,209	3,501	4,186	4,281	5,006	5,919
L. A. Young.....	679	637	402	292	456	775	3,871	2,594	2,384	1,904	2,194	2,417
Totals.....	\$52,050	\$31,260	\$23,699	\$15,770	\$22,832	\$34,914	\$214,774	\$183,326	\$162,784	\$142,841	\$152,571	\$171,014

	Funded Debt (000 Omitted)						Capital and Surplus (000 Omitted)					
	1929	1930	1931	1932	1933	1934	1929	1930	1931	1932	1933	1934
American Chain.....	\$5,200	\$4,522	\$4,194	\$3,844	\$4,352	\$3,458	\$22,468	\$22,446	\$18,680	\$16,336	\$15,763	\$16,296
Bendix Aviation.....	101	420	611	432	302	239	63,513	61,787	61,590	21,666	22,965	24,867
Bohn Aluminum.....	1,902	1,902	1,875	1,767	1,411	499	8,637	8,513	8,273	5,434	6,576	7,038
Borg-Warner.....	1,909	1,819	1,601	1,586	1,075	1,075	32,278	31,283	30,551	28,256	28,964	30,782
Briggs Manufacturing Co.....							32,530	35,564	32,990	22,895	24,486	26,237
Campbell, Wyant & Cannon..							5,556	5,553	5,399	5,085	5,126	5,080
Eaton Manufacturing Co.....	750	750	750				11,085	13,999	11,864	11,169	11,422	11,192
Electric Autolite.....						40	26,021	22,230	21,045	14,708	14,660	17,968
Electric Storage Battery.....							37,013	38,168	36,519	35,355	35,400	35,212
Hayes Body.....							5,532	4,560	3,680	2,734	2,185	1,771
Houdaille Hershey.....							8,974	7,957	10,236	9,381	9,272	9,894
Lycoming.....	512	397	359	131	98		4,200	3,492	4,458	3,899	3,194	2,776
Marlin Rockwell.....							8,943	7,921	7,209	6,735	6,609	6,394
Midland Steel Products.....							15,238	14,896	14,075	13,494	13,502	13,519
Motor Products.....							7,996	8,141	7,605	6,343	5,754	6,734
Motor Wheel.....							14,932	13,502	11,028	9,036	8,557	8,970
McCord Radiator.....	2,395	2,243	2,039	2,005	1,971	1,877	4,317	2,932	2,576	2,182	2,120	1,994
Mullins Manufacturing.....							7,353	6,499	6,442	4,004	2,258	2,445
Murray Corporation.....	3,185	2,860	2,500	2,250	2,000	1,750	24,864	24,458	23,633	12,674	11,954	11,252
Raybestos-Manhattan.....							17,879	17,293	15,876	14,966	15,294	15,433
Spicer Manufacturing Co.....							13,369	13,010	11,589	8,211	7,864	7,230
Stewart-Warner.....							30,667	26,929	20,696	17,183	13,129	11,528
Thompson Products.....							6,522	5,946	5,494	5,245	3,905	4,239
Timken Detroit Axle.....			1,062	940	628		17,851	16,830	16,687	15,299	13,699	13,912
Timken Roller Bearing.....							46,458	46,782	43,305	39,506	40,080	40,793
Trico Products.....	35						4,703	5,669	6,494	6,522	7,003	7,837
L. A. Young.....	642	415	314	223	175	111	8,684	8,248	7,870	7,102	6,989	7,112
Totals.....	\$16,631	\$15,328	\$15,305	\$13,178	\$12,012	\$9,049	\$487,583	\$474,608	\$445,865	\$345,420	\$338,730	\$348,514



Left—Front view of one of the Ford engine race cars showing details of the front suspension. Right—The spherical gas tank and the rear independent suspension

No Immediate Changes Because of NRA Decision

(Continued from page 717)

demonstrated, labor is sufficiently organized in the industry to ward off any general move toward lower wage scales. Little comment is available on the subject of maximum hours, but privately expressed opinions indicated that the code's restrictions on maximum and average hours worked eventually would go by the board. The hours provision of the code has proved particularly onerous to the manufacturers and costly to regular employees whose annual earnings have been reduced by the inability to take advantage of the work that was available for them.

As was shown in a recent AMA report, despite an increase in the average hourly rate to 75.7 cents for the year ended March 1, 1935, from 71.2 cents in 1929, the average pay envelope of workers dropped to \$24.70 from \$32.74 in the earlier period. The 3,000 workers of one automobile company already have accumulated an excess in earnings, averaging a week's pay, over that allowed by the code and would have had to lay off a week had the code continued regardless of whether or not work was available. This situation is believed to exist in a majority of the plants at this time.

In the welter of confusion that followed the momentous court decision few have been willing to express opinions as to the immediate effects upon the motor industry. Taking the long range view, the consensus is that it will be helpful to business generally, that it will make for a better state of mind and that the release from restraint will materially stimulate individual enterprise. One official said: "It was the most favorable thing that has come out of Washington in two years—a milestone in the slow trek back to sanity." It was pointed out, however, that much depends on what steps Congress and the Administration now will take.

Removal of the code will permit price reductions by dealers who find it necessary to

lighten their inventories without any restrictions as to the date of new car announcement which, under the code, governed price cuts by dealers. There is nothing in the picture, however, to indicate factory price reductions will follow code removal. Manufacturers, relatively speaking, have been enjoying a profitless prosperity and are not in position to cut prices. Manufacturing costs are not expected to be affected for some time, and cannot influence this year's run of cars. It is believed that in time material cost may be lower and increased efficiency in automobile plants will be achieved by removal of the restriction on hours worked, which permits fuller use of plant facilities during rush season without addition of large numbers of inexperienced workers.

While word has come from NADA headquarters in St. Louis that the association is preparing plans for continuing the major principles and objectives of the dealer code, no group probably was more disturbed by the passing of the code structure than the retail automobile dealers. It had given them a measure of enforcement that could not have been obtained voluntarily and which many dealers feel cannot be obtained except by law. Effect of the code's demise already is apparent, according to Detroit dealers interviewed, who state that the old "horse-trading days" are coming back fast. Prospects have started making the rounds of dealers seeking the highest bidder for their old cars.

While all bars are down, it is believed that dealers generally will be more cautious than in the pre-code era, partly because of their better experience under the code and

partly because of their already heavy inventories of used cars. Some stimulation to new car sales by removal of restrictions and return to free competition probably will result, according to some observers. But sales executives generally are eagerly looking forward to reports for the coming week which will indicate to what extent buying will be influenced. The effect on used car prices is expected to be mixed. Many book prices were considered high, while late models and some of the higher-priced makes were said to be too low. An evening up is considered likely. With dealers in position to bid higher for used cars of higher-priced makes—sharing their margin with the customer—it is highly probable that cars in the upper price ranges will enjoy a bigger demand. This class was particularly hard hit by the code.

Incidentally, some dealers point out that salesmen probably will be returned to a strict commission basis again, just as they were before the code, which had given them a minimum drawing account of \$17.50 a week.

Like everyone else, labor was somewhat confused by the Supreme Court decision ending the NRA. In the absence of F. J. Dillon no comment was available from the AFL Detroit office. Arthur Greer, president of the Associated Automobile Workers' Union, said he could not see that the NRA had done the worker much good beyond making him a little more "union minded," and was not particularly disappointed at its passing. He felt that it might give Congress more reason to pass the Wagner and the 30-hour bills in a modified form that would meet with requirements of the constitution.



British cab-over-engine job on Ford chassis

NLRB Suspends Activities, Prepares for Dissolution

The National Labor Relations Board has suspended activities and indicated it was preparing for dissolution June 16. The Board announced neither it nor its Regional Boards will hold any further hearings pending determination of some future policy. No decision has been made with respect to election cases argued but not yet determined by the courts.

Miller Powers New Front Drive Suspension Racers with V-8

THE ten racing cars powered by Ford V-8 engines which were built by Harry A. Miller, leading racing car designer, for the 500-mile race Decoration Day at the Indianapolis Speedway, present many unique and some radical departures in racing-car design, including a new front-wheel drive system.

The design of the cars in combination with the relatively low height of the V-type engine results in complete streamlining of the entire chassis and reductions of both the overall height and the frontal area, the latter being almost 4 sq. ft. less than that of former racing cars built by Mr. Miller.

Although the cars have an unusually low center of gravity, they have a ground clearance of 6 in., which is considered high for a racing car. The driver's seat is 13 in. high. Hence it is possible for him to touch the ground with his hand when seated in the car.

While in the strict sense of the word, these are racing cars, they contain a great many standard Ford V-8 units and production parts.

Powerplants of the Miller racing cars are Ford V-8 engines, with the necessary changes to adapt them to racing conditions. Standard Ford V-8 blocks, cast crankshaft, connecting rods, valves, push rods and valve guides are used. The only changes in the Ford alumi-

num alloy cylinder heads were made to increase compression to racing requirements. Pistons, crankshaft and connecting-rod bearings also have been replaced by types better adapted to racing conditions.

The engines have the standard Ford bore and stroke with a piston displacement of 221 cu. in. The only change made in the cylinder-block casting was the grinding and polishing of the intake and exhaust ports. The special racing pistons have a greater head-to-pin height to aid in increasing compression and are fitted with the customary racing engine clearance of 0.005-0.007 in. Each piston is fitted with four rings. The piston pins are of the full-floating type held in place by aluminum plugs. The plugs are machined to the same radius as the cylinder walls, a long-established practice with Miller. A special camshaft is used.

The right and left aluminum-alloy cylinder heads are interchanged so that the water outlets will be at the front of the reversed engine. The compression ratio is 9.5 to 1.

Cylinder-head gaskets are of the laminated type, composed of four thicknesses of aluminum and one thickness of copper, each layer being 0.010 in. thick. This type of gasket expands slightly with heat and increases the effectiveness of the seal.

No change has been made in the oil circulation system, but an oil cooler has been added to meet racing conditions. The Ford V-8 oil pump is used. The oil pan has been enlarged to increase its capacity to 2 gal. Attached to the bottom of the oil pan is the radially finned, continuous-tube-type oil cooler. A 2½-gal. reserve supply of oil is carried in a tank in the cowl, with gravity feed to the oil pan. Oil-level, oil-temperature and oil-pressure gages are mounted on the instrument panel.

In order to provide the increased effectiveness of the cooling system necessary to dissipate the increased heat developed in racing, a special water pump is mounted at the rear of the engine and driven by the camshaft. The pump

has a separate outlet to each bank of cylinders. While the radiator is of special shape to conform with racing design, it is of the same general construction as the production part.

Ignition is supplied by a Bosch high-tension magneto with fixed spark setting. It is mounted behind the engine and coupled directly to the end of the crankshaft. Each spark plug cable is encased in a separate metal tube to prevent inductive interference. Spark plugs are of standard 18 mm. size.

Four Stromberg dual down-draft carburetors are used to insure maintenance of mixture proportion and equal distribution to all cylinders. The intake manifold and valve-chamber cover was redesigned to accommodate the four units. Two of these carburetors furnish the major fuel mixture supply up to a speed of 108 m.p.h., at which point the other two carburetors cut in. This arrangement is expected to give 18 miles per gallon up to 100 m.p.h. The fuel supply is carried at the rear in a 15-gal. spherical tank having a three-point mounting, one of which is rubber insulated. The tank is provided with two outlets, one at the bottom, the other 1½ in. above it, with a valve arrangement that provides a reserve fuel supply. Air pressure from a hand-operated pump at the right corner of the instrument panel is used to feed the fuel to the carburetors.

A unique arrangement of the exhaust outlets was adopted to obviate interference with the streamlining. Flexible metal tubes conduct the gases from the two manifolds to a flat, rectangular exhaust pipe under the center of the car. This exhaust pipe is made from corrugated sheet metal and is 12 in. wide, 1½ in. deep and 6 ft. in length. It fits into a depression in the floor of the body, with a 0.5 in. space above it for air circulation.

Because of its shortness (the crankshaft being only 22 in. long) the Ford V-8 engine is particularly adaptable for use with the Miller front-wheel drive, the complete mechanism of which is enclosed in an aluminum casting bolted directly to the flywheel housing of the reversed V-8 engine, thus forming a single unit. The housing is so designed that it serves as the two front supports for this unit and the engine, which with the single support on the tubular frame cross-member at the back

Drive, Independent Modified Ford Engines

of the engine furnishes a three-point suspension for the entire powerplant. The complete front-wheel-drive unit, which contains the clutch, ring-gear and pinion, the transmission, and the independent front-wheel-suspension systems, weighs only 371 lb. The distance from the flywheel housing to the center line of the front wheels is only 7.5 in., which gives an idea of the compactness of the front-drive unit.

A regular Ford clutch, with double springs to handle the increased power, is used, as are a standard Ford driving pinion and ring gear. The transmission has two forward speeds and reverse, with synchronizers for the two forward-speed gears. The "low" gear gives 80 per cent of top speed. The transmission is on one side of the ring gear, with the differential-gear case on the other side.

The differential gears are standard Ford production parts, and one-half of a standard Ford differential housing is also used. A short shaft extends from the right differential side gear to the outside of the housing where it is attached to a universal joint. The shaft from the left differential side gear passes through the inside of the tubular main transmission shaft to a universal joint on the left side of the case. Short drive shafts extend from these universals to additional joints at the wheel spindles. These shafts have been machined from standard Ford axle shafts. The universal joints at the wheels are of the constant-velocity type.

The independent front-wheel suspension to accommodate front-wheel drive is of an entirely new Miller design. Tandem mounted transverse springs are rigidly attached to each side of the front-drive-unit housing. Their outer ends fit into the universal-joint mountings at the wheels. These mountings are used both for the attachment of the wheel spindles and to furnish the means of supporting the ends of the upper and lower independent suspension links.

The links or arms are of novel design in that they not only provide the necessary wheel support but are so shaped that they completely enclose the springs, driveshaft and brake cables. They thus afford complete streamlining for the entire independent suspension system. They are approximately 13 in.

long and 17 in. wide, with the edges of the upper casting slightly overlapping the lower. All outer surfaces of these castings are polished and are curved to give the streamlining mentioned above.

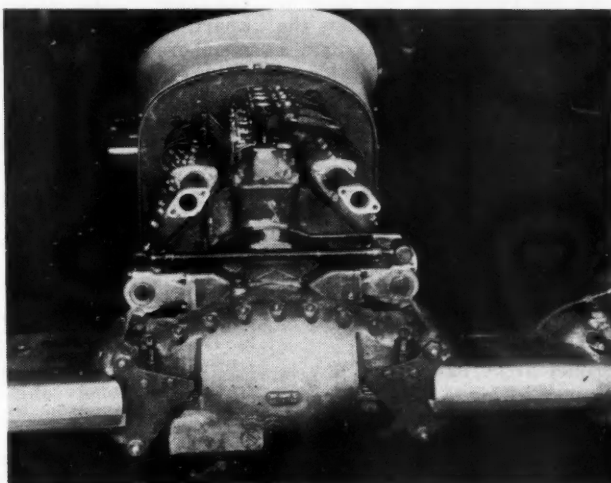
The inner ends are hinged at two widely separated points on the front-drive-unit housing. The outer ends are similarly used for the attachment of the wheel-spindle mountings. They have been laboratory-tested and will stand a load of 18,000 lb. each, or 18 tons per pair. They, as well as the steering arms and other essential parts, have been X-rayed to make certain that no internal flaws exist.

The cars were designed specially for racing on the Indianapolis track, which for more than a third of its length is substantially banked, to permit high speed around the turns. The new Miller front-wheel-suspension system was designed to permit the cars to take these banked curves at high speed, smoothly and with a minimum of tire

slippage sidewise. The tread of wheels remains practically constant within the operating range of the springs. Hence there is no measurable slippage of the tires sidewise. Track tests are said to have proved that this type of suspension is well suited to racing. The transverse springs are fitted with special shock absorbers of Miller design.

Standard Ford brake assemblies are mounted on the spindles. In order to retain complete streamlining, levers are attached to the brake backing plates, so that brake actuation can be made by means of cables and conduits.

The wheel hubs are of typical Miller design carried on three ball bearings, a large inner bearing, which carries



Front view of one of the Ford-engined racers. Front wheels are independently suspended. Four carburetors are used on the engine

both radial and thrust loads, and two smaller bearings at the outer ends. Each bearing is held in position by means of a nut, a flexible washer and lock-nut.

The steering unit used contains two sets of eccentrically mounted spur type pinions meshed with internal gears machined in the housing. Approximately 10 teeth on each of the two pinions are in constant mesh with the two internal gears. This makes a very compact type of gear with low friction, and provides a ten-to-one reduction with coaxial external shafts. The mounting bracket for this gear is bolted to the front-drive-unit housing, with the steering-gear arm for the left wheel mounted directly on the end of the steering gear and inside this yoked bracket.

A short steering rod extends from the ball on the bottom of this arm to the left-wheel knuckle arm. From the upper end of the steering-gear arm a tie rod connects with an identical arm similarly mounted on the right side of the front-drive housing, with another short steering rod connecting to the right knuckle. A small needle-bearing-type universal joint is interposed be-

tween the steering gear and the steering wheel to take care of the angularity of the steering column mounting. At the instrument panel the steering tube is mounted in a self-aligning ball bearing. The steering wheel is of the flexible-spoke type, each spoke being made up of a number of spring steel rods, and the rim of the wheel has a covering of soft rubber.

The frames are of very unusual design. Side-rails are 6 in. in depth, with a 1½-in. flange at the top. In place of a conventionally formed flange at the bottom, the side members are made with a 2½-in. radius and extend for a distance of 3 in. from the flat side. There is a 2½-in. tubular member at the rear of the engine, which also serves as the engine support, and there are two more 2½-in. tubular members at the rear of the frame, spaced 9½ in. apart, with two supplementary tubular members directly above, which are also used for the three-point mounting of the fuel tank.

The torsional rigidity of the frame is such that a jack placed under one corner of the frame will also raise the rear corner on the same side. Inside

of the frame is a steel floor extending from the dash to the rear of the car. The brake- and clutch-pedal shafts and the gear-shifting mechanism are on the inside of this floor, as are also all brake cables, gas and air lines. The only protruding part below the body is the flat exhaust passage.

The suspension for the rear wheels is identical in type with that used at the front except, of course, that it does not contain any driving mechanism.

In place of the conventional tachometer, the cars are fitted with 180-m.p.h. speedometers. In addition to the oil-pressure, oil-temperature and oil-level gages, the instrument panel also carries water-temperature and air-pressure gages. An ignition switch is mounted at the lower edge of the instrument board.

The bodies conform with general racing-car requirements, having curved cowlings, staggered seats for driver and mechanic, and the customary fish-tail rear design. The radiator grill follows the lines of the 1935 Ford cars. The cars are symmetrical in form and their appearance is enhanced by unusual color treatments, different for each car.

Monthly Sales Contest Plan Offered by NSPA

On a "money back" basis the NSPA is offering its membership a "Plan-a-Month" contest service. Subscribers to the service will receive each month for one year a complete new set of sales contest materials with full and detailed instruction for their use.

For the contests, which have been worked out by John M. Kumler for the association, subscribers will receive a large wall chart showing the progress of contestants, illustrated prize books for salesmen, credit certificates for issuance to salesmen showing their standing and which are used in purchase of the merchandise prizes offered. In announcing the contest NSPA stated that if a particular set-up did not seem applicable at the immediate moment it could be filed and used at a later date, for each of the 12 contests are so constructed that they do

not depend upon a time element for their effectiveness. All contests run from two to 12 weeks. Subscribers are guaranteed return of their money if the contest results are not satisfactory after proper trial and following of instruction.

Car Duties Stand, Tire Levy Cut by Swedish Pact

The American-Swedish reciprocal tariff agreement, effective 30 days from May 25, provides for the binding of the present duties of 20 per cent ad valorem on American automobiles and chassis, 15 per cent on automobile parts, and 14 per cent on accessories. The Swedish duty of 120 crowns per 100 kilograms on automobile tires was reduced to 100 crowns per 100 kilograms. This new duty, on the basis of 1933 imports, was equivalent to about 30 per cent ad valorem. American exports of rubber tires to Sweden in 1933 were valued at \$375,700

and in 1934 this had increased to \$805,000.

Sweden is one of the best markets in Europe for American motor vehicles and from 80 to 90 per cent of all motor cars in use are of the American type, either imported directly from the United States or produced in Sweden or other European assembly plants. In 1933 the value of exports of automotive products from the United States to Sweden was \$2,005,000 and in 1934 increased to \$6,229,000.

Chick Starts West on Coast-to-Coast Trip

Enroute on the second leg of a coast-to-coast survey of business conditions, J. C. Chick, general sales manager for the Cadillac Motor Car Company, left Detroit last Monday on a three-week 5000-mile trip through the West.

Mr. Chick returned to the home office a week ago after a similar trip to key cities in the East. He was accompanied on his western swing by K. E. Gray, head of the Cadillac-LaSalle business management department.

Mr. Chick will go first to the Pacific Coast, visiting Los Angeles, San Francisco, Portland, Seattle and Spokane. Returning to Detroit, he plans to stop also at several of the larger cities in the middle west.

R. T. Keller, Son of Dodge Chief to Wed

The engagement of Miss Maxine Lorraine Smith, daughter of Mr. and Mrs. LeRoy A. Smith, and Robert Thomas Keller, son of Mr. and Mrs. K. T. Keller, was announced Monday, May 27th. The wedding will take place in July. Mr. K. T. Keller is president and general manager of Dodge Brothers Corp.



Vincent Bendix, president of The Bendix Aviation Corporation, was the guest of honor at a banquet held last week (May 20) in South Bend, Ind. There were in attendance all leading officials of the many Bendix subsidiaries and more than 300 distributors who sell Bendix products.

Firmer Tone in Retail Market

(Continued from page 717)

healthier condition than it has been in years, a noteworthy detail being marked increase in all-cash deals.

Cadillac-La Salle

Cadillac-LaSalle retail sales through May 20 this year reveal an increase of 141 per cent over the corresponding period of 1934. Sales during the second 10 days of May showed an increase of 155 per cent over the like period of last year.

G-M Spring Shows

Sales of G-M cars and trucks at the spring showing in 51 cities throughout the country totaled 12,382 units, according to complete reports just compiled in Detroit. In addition, 3113 Frigidaires were sold. The total attendance was 3,017,353. In the 49 cities where spring showings were held last year and this year, 10,011 cars and trucks were sold this year, compared with 9222 in 1934, a gain of 8.6 per cent.

Sales gains were registered in practically all cities, Los Angeles leading with an increase of 540 per cent. Sharp increases were recorded in Baltimore, Buffalo, Dallas, Houston, Minneapolis, New York, San Francisco and Seattle.

Buick

Domestic retail sales of Buick cars during the first 20 days of May totaled 4,392, an increase of 1,258 units, or 41 per cent over the similar period last year. The second 10 days of the month accounted for 2,292 cars, a gain over the first 10 days and comparing with 1,553 units in the corresponding 1934 period. Buick's retail volume is the best since July last year when the new lower priced series 40 was introduced. While the current month's production and shipments have been increased dealer stocks were reduced as result of the last 10 days' sales.

Oldsmobile

Oldsmobile production of 80,623 of the 1935 cars by May 21 exceeded the production figure for the entire 12 months of 1934, which was 79,813 units. "It is assured that we will pass our all time high in production this year," said general sales man-

ager D. E. Ralston. The peak established in 1929 was 103,000 cars. "The large bank of orders on hand and optimistic sales outlook for Oldsmobile during the summer months means that we will continue our record breaking production schedule which has necessitated double shift in all departments."

Dodge

Dodge dealers last week delivered 7,785 Dodge and Plymouth passenger cars and 1,217 trucks, a total of 9,002 vehicles comparing with 8,697 in the preceding week. Used car sales of 8,850 vehicles topped the previous week's figure by 434. To May 25 this year, passenger car deliveries by Dodge dealers totaled 127,316 and truck deliveries were 21,579 units, a combined figure of 148,895 units comparing with 93,264 in similar period last year.

Chrysler

Retail deliveries of Chrysler cars during week ended May 25 totaled 1,157 compared with 1,128 during preceding week. At the same time Chrysler dealers also delivered 3,841 Plymouths or a total of 4,998 units which was 29.8 per cent in excess of the same week a year ago. In the first 21 weeks this year Chrysler dealers delivered 17,814 Chryslers and 64,120 Plymouths, or 81,934 units combined, which is a gain of 50.3 per cent over like 1934 week.

Plymouth

Plymouth retail deliveries for week ended May 25 totaled 10,016 units, making the second largest week in the Company's history and showing an increase of 30 per cent over the corresponding week last year. The record week was that ended April 6 when 10,055 cars were delivered. In the first 21 weeks this year Plymouth dealers delivered 166,369 cars compared with 119,336 in the like 1934 period, a gain of 39.4 per cent.

Car manufacturers received this week from the National Automobile Dealers Association a lengthy statement of principles and methods for correcting conditions in the dealer field. The dealer association asked for prompt replies.

Chrysler Workers Assured of Unchanged Wage Policy

Chrysler Corporation issued the following notice to its employees in reference to the NRA decision:

"To the employees of Chrysler Corporation:

"The management desires the employees to know that no change in the wage policy of Chrysler Corporation is contemplated as a result of the decision of the United States Supreme Court in the NRA case."

GM Plans No Change in Wages, Sloan Says

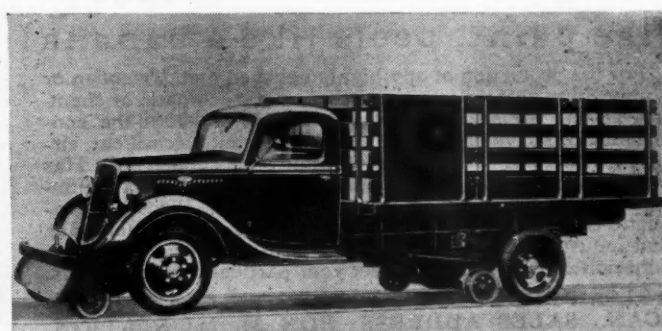
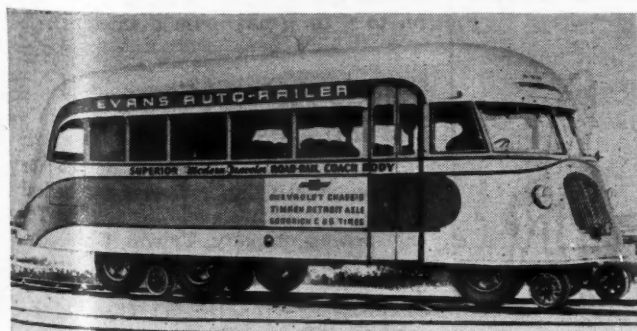
(Continued from page 717)

"So far as the broader implications of the decisions are concerned, I am satisfied that they will eventually be recognized as vital steps forward in promoting a sane industrial recovery. Sooner or later, we are bound to recognize that regimentation and bureaucracy have no part in our national economy. They can only produce one result—lowered efficiency, increased costs and reduced standard of living. We have also to recognize the fallacy of the 'theory of scarcity' upon which many of our recovery programs are based. Recovery can be promoted only by increasing productivity. Arbitrary and uneconomic increases of the factors that make up prices penalize productivity and retard recovery. Employment is reduced as well.

"Today, I believe, the foundation is set for a great forward movement of business and industry, not only in this country, but throughout the world. We no longer need to promote recovery—but we do need to stop obstructing it.

"The Supreme Court decisions of Monday make a most important contribution toward eliminating some of these obstructions. Unfortunately, there are others. So far as American industry is concerned, it is again a free agent and can be counted upon to reassume the responsibility that it has so effectively discharged in the past in providing for our people the highest standard of living in the world."

Evans "Auto Railer" Runs On Highways and Tracks



A vehicle for the transportation of freight and passengers over both rails and highways has been developed by the Evans Products Co. and is being offered to the railroads of the country under the name of the Evans Auto-Railer. Any standard truck or bus can

be converted for dual service by equipping it with the flanged pilot wheels and other parts of the equipment. These pilot wheels are retractable and are automatically lifted and locked in the retracted position for highway travel, by the manipulation of con-

trol levers inside the cab. One advantage of this type of vehicle is that it permits of store-door pick-up and delivery of LCL freight shipments without reloading. The drive on both rail and highways is through the rubber tires.

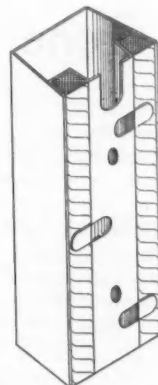
"Holtak," a New Tacking Strip

With the growing acceptance of all-steel body construction, body engineers and production men will be interested in possibilities of "Holtak," the specialty tacking strip which is being distributed by Diversified Products Co., Detroit, Mich.

The material of which the strip is made is treated by a special process that makes it impervious to the action of moisture and aging effects; it is also claimed to resist temperature ef-

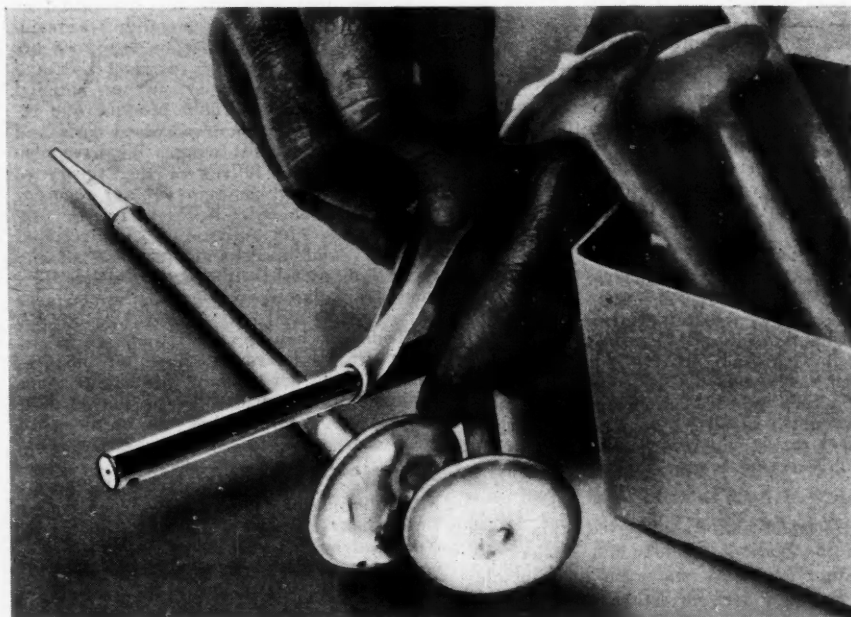
fects and thus is unaffected by exposure to the baking oven atmospheres during operations in the paint shop.

Holtak provides a secure anchorage for upholstery tacks and is said to grip the shank of the tack with a high compression, high friction squeeze. While the material may be applied in any convenient fashion, the manufacturer recommends the construction shown in the sketch—adaptable to any all-steel job. The sketch shows a section of a body pillar and a similar construction may be used for roofs, cushions, windshield headers, belt strips, and seat tacking strips.



The material is available in any length or cross-section and is said to conform freely to any body contour. It does not twist or warp.

NOW—A removable



LIQUID RUBBER COATING . . Applies and dries

like paint, peels like a banana

For the protection of any highly polished metal, wooden or composition surface from scratches, marks, climatic or chemical attack, Kelsanite before application is about the consistency of heavy cream. Cures when dry into a resilient, airtight, water and chemical proof, removable rubber coat. Has unlimited industrial applications. Protects any part or finished product in process, transit or storage. Displaces conventional greasing and wrapping of large or small automotive and industrial parts. Kelsanite's consistency and degree of adhesion can be varied to meet your particular requirements.

KELSAN PRODUCTS. FACTORY: ST. CLAIR, MICHIGAN. SALES ADDRESS: BOX 34, MJ STATION, DETROIT, MICH. PHONE MADISON 7680.



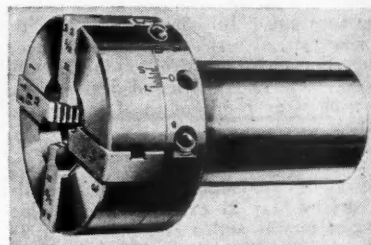
KELSANITE

June 1, 1935

Geometric Solid Adjustable Die Head

The style DJ Geometric Solid Adjustable Die Head is a new tool designed by the Geometric Tool Co., New Haven, Conn., primarily for cutting short threads where the time required for backing off is not important. This tool may also be used to advantage on chucking machines and similar equipment where the swing is very limited.

One die head will cut a wide range of different diameters and pitches through the use of inexpensive removable chasers. Not only does the die head have a short overall length



but its outside diameter is also kept as small as is consistent with proper chaser bearing support. Chasers can be replaced inexpensively, changing from one size to another, and each set of chasers is adjustable for size.

The tool is built in sizes from 5/16 in. to 6 in. (maximum diameters).

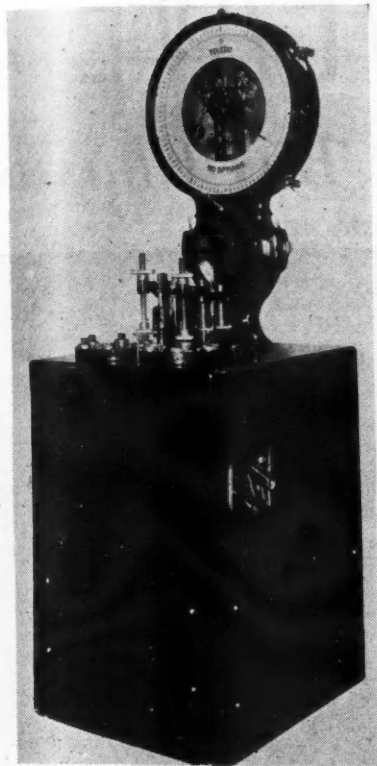
Toledo Automatic Testing Device

An automatic inspection device for testing, classifying and sorting helical springs has been developed by the Toledo Scale Company, Toledo, Ohio. The springs are automatically separated into three groups according to their compression strength: (1) Those of the correct stiffness, (2) those that are too "light," (3) those that are too "heavy." The "heavy" springs are used for exhaust valves; those of medium stiffness for intake valves; and the "light" springs are rejected.

This automatic classification is ac-

Automotive Industries

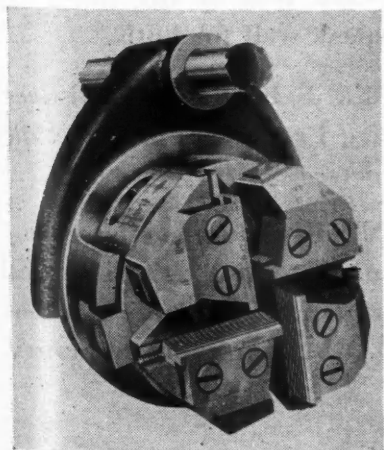
complished as follows: There are two revolving index plates on the platform. Each of these is equipped with several apertures into which the operator places the springs for testing. As these index plates revolve, each spring is in turn compressed. The mechanism has



been "set" for a predetermined load. Any variation in the compression of a spring is automatically measured against this standard, and the mechanism is actuated according to whether the spring is light, medium, or heavy, causing the discharge spouts to move to the right, center, or left.

Revolving Die Head With Taper Attachment

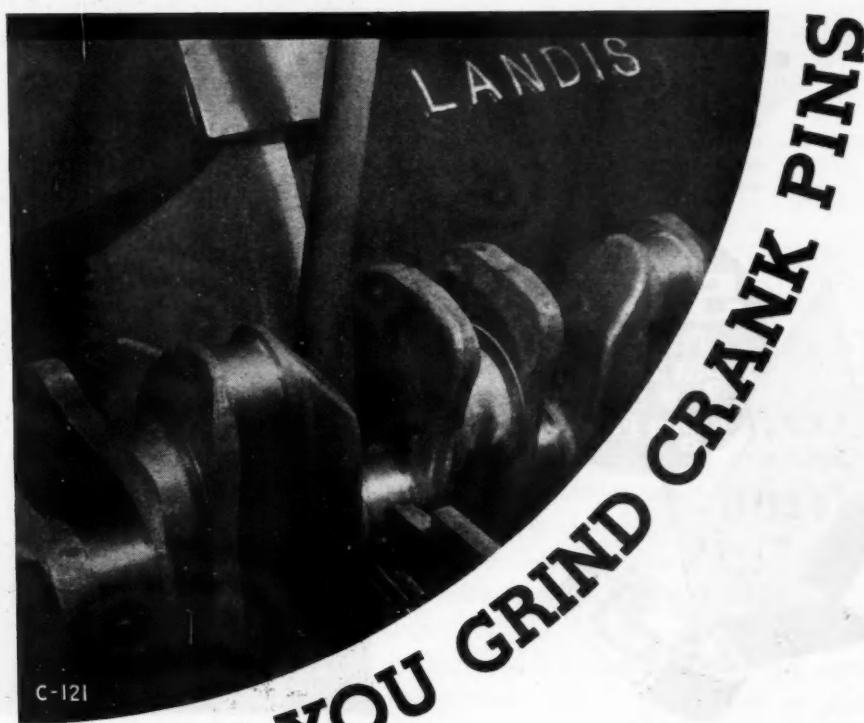
Landis Machine Company of Waynesboro, Pa., has placed on the market a revolving die head with taper attachment for producing tapered threads.



This head is an adaptation of the $\frac{3}{4}$ -in. LANCO Head, but has a standard capacity up to $1\frac{1}{4}$ -in. American Tapered Pipe Thread with a maximum thread length of $1\frac{1}{4}$ in. By using special over-size chaser holders, diameters up to $2\frac{3}{4}$ in. can be cut with a maximum thread length of $1\frac{1}{4}$ in. Any degree of taper can be provided up to 2-in. taper per foot by using the proper operating ring and cam shoe.

The taper cutting action is obtained through a cam which is integral with the operating ring. Attached to the closing ring of the die head is a cam shoe which is machined to correspond to the operating cam. As the thread-

ing spindle moves forward, the closing yoke on the die head contacts the adjustable stop nut on the machine just as the chasers begin to form the thread. At this point the forward travel of the operating ring is retarded, while the die head continues to move forward. As the die head continues to move forward onto the work, this construction causes the chasers to open gradually, thus generating a tapered thread. When the cam shoe has traveled the full length of the cam on the operating ring the die head automatically opens. Adjustment for thread length is obtained by properly setting the stop nut on the stop bar.



C-121

WHEN YOU GRIND CRANK PINS

When you grind crank pins you are always striving for higher output, greater accuracy and better finish. As a very real aid in the securing of these ends we recommend the Landis 16" Type D Hydraulic Crank Pin Grinder.

Operators like this machine. A work center line only 36" from the floor makes easier the loading and unloading of heavy crankshafts. Seven machine movements are controlled by a single conveniently located lever. Safety features thoroughly protect both the operator and the machine.

These are only a few of the reasons why the Landis 16" Type D contributes so largely to economical manufacture and improved product. You should see one in operation to fully appreciate its possibilities.

195

LANDIS TOOL CO.

WAYNESBORO, PA.

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Of Truck And Bus Chassis

● SKF makes practically all types of anti-friction bearings. When SKF recommends a particular type of bearing, therefore, you may depend upon it; its recommendations are unbiased!



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GOOD Bearings and good trucks give **DEPENDABLE** performance. And that isn't saying too much for either the **SKF** Automotive Propeller Shaft Box or the Brockway Truck. Years of hard service speak well for both.

The aligning feature of the **SKF** Self-Aligning Ball Bearing makes the **SKF** Automotive Propeller Shaft Box *different* from other center supports.

Its **ROLLING SELF-ALIGNMENT** allows for chassis weave... frame distortion... and shaft misalignment. It's the logical result of specialized work by pioneers who years ago took the guesswork out of bearings. **YOUR** equipment deserves it.

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June 1, 1935

Automotive Industries